Mining Journal

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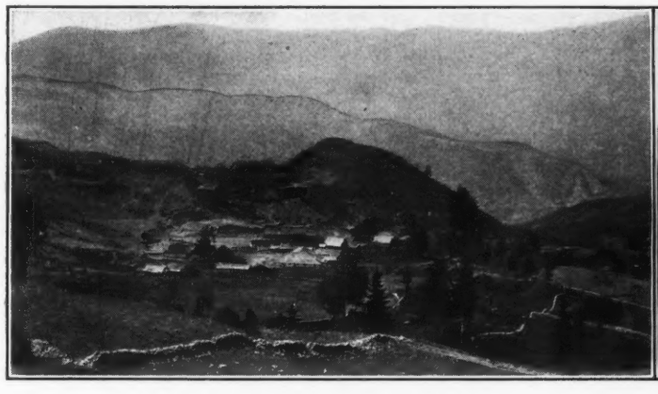
In and Out of the Caucasus in War Time

By Leonard C. David*

SYNOPSIS—The Caucasus embraces the country between the Black and Caspian Seas and between the Caucasus mountains and the Turkish border. Population is Oriental, Georgians predominating. Mines are 40 miles from Batoum. Turkish invasion was not at first regarded seriously, but their troops soon captured the surrounding country, obliging foreigners to take to flight. An American manager was wounded, but managed to escape with the others. The flight from Batoum to London is described.

The Caucasus district of Russia, where fierce fighting is now in progress, is that part extending from the northern limits of the Caucasus mountains, south to the Turkish frontier, bounded on the west by the Black Sea and east by the Caspian Sea. The principal cities are Tiflis, the home of the viceroy; Batoum, Russia's most southern Black Sea port; and Baku, a Caspian sea port; all on the railroad running between Batoum and Baku.



A Caucasus Mining Village

Country of the Georgian Military Road

Russians a Minority in Population

The Caucasus is inhabited by Oriental people, but the Georgians predominate. The Russians are vastly in the minority, and it is distinctly an Asiatic country, rather than European, in dress as well as customs. The Christian Georgian, the original Caucasian, occupies a district called Georgia. The Mohammedan Georgian, made Mohammedan by Turkish invasions, occupies all the farming land near the Turkish frontier. The land is fertile, although the farms are of small extent because flat country is only found in spots. The people raise tobacco, corn, vegetables, fruits, etc., for their own consumption, and the work incident to this is all done by women, who, with veils on their faces, babes on their backs, and interested husbands as onlookers, work diligently in the fields. As a European passes, however, the instinctive womanly curiosity impels them slyly to lift the veil and see the latest styles in dress. Plowing is with oxen and antiquated wooden plows. The natives make their own flour by grinding corn in their little mills close to the house. They hew out logs and use them as launders to gather the little mountain streams and lead them to the mill for power.

The principal industries are mining of oil, copper and manganese and farming. Oil is pumped in 6-in. lines from Baku to Batoum, a distance of about 300 miles, and thence is shipped to all the world. This oil, or *mazoot* as it is called locally, is pumped through branch lines to industrial plants and used as fuel, although the development of water power from mountain streams is slowly replacing the use of oil.

The Georgian Military Road

Our mines were situated 6000 ft. above the sea and 40 miles from Batoum. One travels from Batoum by phæton on the beautiful Georgian military road, which winds its way up through the mountains along the river Churuk, which figures so largely in Caucasus war news. It is interesting to see a roller, manufactured by the Austin Manufacturing Co., of Chicago, at work on this road. On each side of the road one sees here and there a little farming settlement. The mountains are precipitous, vegetation luxuriant and scenery beautiful. Leaving

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the Churuk River at a station called Borchka, one crosses by ferry and follows the Mourgul River, a branch of the Churuk, which follows the road that leads to the Caucasus Copper Co.'s smeltery. A final sudden ascent on a zig-zag road terminates at the mines, 2000 ft. above. The mines are in the midst of farming settlements, but there are no farms above them, as the country above is rough and mountainous.

About 75% of the employees were Mohammedans from Turkey, the border being only a day distant, and the Turks walk back and forth. The rest of the employees were Persians, Armenians, Greeks, Georgians (Christians) and Russians. The native Russian subject Turks did no manual labor at the mines, but were used as foremen, tally men, etc. The laborers for the most part work seven days a week. They even found time to make their own socks, and it was a common sight to see the men at night busily engaged with their knitting needles. A more peaceful class of labor could not be found anywhere, due, no doubt, to the fact that the Turks do not indulge in intoxicating liquors. I have, however, seen a few boys overcome by eating native honey. The Turks are religious fanatics, but only have two sets of holidays, Ramadan Byram and Kurban Byram, and their antics at these feasts arouse the interest of the Occidental. During Ramadan, which precedes Ramadan Byram, they work every day, but do not eat, drink or smoke while the sun shines. This lasts for 30 days, and it is a common sight, near the end of Ramadan, to see a laborer in the hot sun succumb to exhaustion and have to be taken home. There is no false modesty about their religion. A laborer will drop his tools in the midst of work, wash his hands, face and feet, spread out the prayer rug or handkerchief and pray toward Mecca. The prayer lasts about twenty minutes.

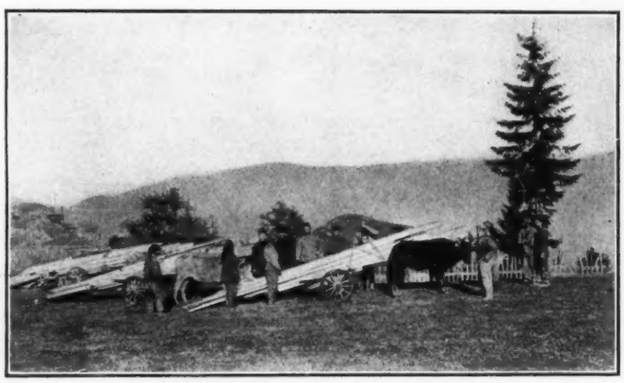
In dress the laborers all look alike, handkerchief turban or fez on their head, wall-paper patterned blouse shirt, Eton jacket, and pantaloons which are always very baggy. Their footwear consists of a piece of cow's-hide with the hair on, sandaled with string around the heel and ankle.

War Declaration Changes Conditions

As soon as war was declared between Russia and Turkey, many of our Turkish and Persian subjects left. The Georgians also departed for their beloved Georgia, fearing trouble between Christians and Mohammedans. Before and after war was declared the Russian military and civil officials came to visit us and granted immunity from arrest to Turkish subjects if they remained at work at the mines. An explanation of this may be that Russia needed copper and was willing to make concessions to keep the mines going. The officials repeatedly insisted that we were absolutely safe and out of the danger zone. Russia was making inroads into Turkey near Erzerum, and we felt that with all the mountains on the border covered with snow we were quite safe. Moreover, we could not imagine a military operation being carried out in such mountainous country. The Russian military authorities insisted that they were prepared for any emergency, but were sure that no trouble would arise. In justice to the American Consul, I would say that he had reminded us by letter of our proximity to the frontier and the possibility of our being exposed to danger, but we rather put our faith in the manager, who, we thought, had inside information from the Russian military officials. He acted in good faith, but the Russian officials did not understand what was going on.

Mine Manager Wounded by Turks

On Friday, Nov. 13, we heard rifle shots several times during the day. Naturally excitement ran high. Most of our Turkish laborers ran away for parts unknown and the rest of us were trying to get the truth of what had happened. The Russian military officials explained the shooting by saying that Russian soldiers at the smeltery fired up the valley on their own soldiers, thinking they were Turkish soldiers. The truth was, as we learned after, that the Turks started an advance through the only pass left open, Kura pass, and had taken the Russian outpost with little resistance. On Saturday, the Governor came up to tell us all how safe it was and that the Russian army was moving the Turkish frontier farther away from us each day and the conditions were changing only for the better. Sunday, we were mining nearly a normal tonnage of ore, when about twelve o'clock we heard some shots below us in the valley. Then the telephone bell rang and we received word from the smeltery saying that the native aide of the general manager returned to the smeltery with the news that the manager, an American, was wounded en route from the smeltery to the mines. The afternoon was spent in a search for the wounded man and he was found hiding behind rocks where he



Native Transport by Cattle

remained until taken out safely under the cover of darkness. After the manager was wounded, we heard volley after volley of shots and knew that the Turkish soldiers were making a successful advance, gaining the best positions while the Russians waited below.

Safety Sought in Flight

That evening the Russian police advised us to sleep with our clothes on, but we feared that if the Turkish soldiers captured the smelting plant before we got there, our only exit to Batoum would be cut off. So we decided to pack up and leave at midnight with all the women and children, going down the ropeway foot road, as the Turks controlled the wagon road. This flight, as well as the rest of the trip home, had its dramatic side and was replete with hardships. Space does not permit telling of the misfortunes suffered by many of the employees, but the manager did all in his power, in his injured condition, to aid in the flight to safety. We didn't feel very safe on this trip as we did not know the attitude of the native Russian subject Mohammedans, as they say "blood is thicker than water." Also we could use no lights as we

feared drawing the fire of the Turkish or of the excited Russian soldiers. The Russian guards met us at the smeltery with drawn bayonets until they learned who we were.

I met the Vice-Governor at the works. He told me that instead of 2000 soldiers that we were led to believe were guarding us, there were only 180 on hand. The Vice-Governor said, "There are not more than 100 Turkish 'marauders' in the mountains. In the morning we will bring up six cannon and more soldiers and when we start to shoot the cannon, the Turks will just run." But he neglected to say which way they would run. We all left at daybreak, traveled to Bortchka by phaeton, then down the current of the Churuk in a *kyyook*, the native gondola, and then another short phaeton ride to Batoum. We did not have phaetons for the complete trip, as there were too many fugitives for the supply of phaetons.

the fire from enemy's boats, should they make a visit at night.

Turks Capture Russian Artillery

The following morning the Turks met the Russians at the smeltery, the Turkish soldiers having secured all the good positions. The Russians started to shoot their cannon at 8 a.m., and at 8 p.m. the Turks had the cannon and the Russians retreated. We had fled in time. Unfortunately some did not realize the gravity of the situation, and when we called the roll in Batoum, one American and one Englishman were missing. Every effort was immediately made to locate them. The American Government located the American at Trebizond, where he was a prisoner and later was released. We have not yet learned of the whereabouts of the Englishman. Instead of a few "marauders," it was a part of a great

Typical Scenes in the Caucasus

A merry-making group of native laborers. Group of young Turkish girls. A Greek mine foreman and a Russian policeman

On our way down we passed the artillery and motor trucks laden with soldiers on their way to the smeltery from Batoum. It looked good and we felt that we were going to Batoum to stay but a few days until the Russian soldiers cleared the mountains of "marauders." We found the people of Batoum more excited than we were, fearing attacks both from sea and land. The police of Batoum were so excited that they arrested all suspicious people as German spies. Even an Irishman of our party, who talks very broad Irish, was arrested as a German spy because he smoked a curved-stem pipe. Everything was dark in Batoum at night. At the hotels, we could not use the electric lights and the windows were covered with dark paper to keep the candle lights from showing through. They had a spot lit up a few miles from the city so as to have the lights, rather than the town, draw

movement the Turkish army was making. The Turkish soldiers were supplied with smokeless powder and the latest equipment and were led by German officers. Shortly after we arrived in Batoum, we saw Russian officers who had been at the smeltery, riding around in phaetons and automobiles. We left Batoum the next day, after spending all night in the depot waiting for a train that had sufficient room. It seemed as if all Batoum was at the depot. The military authorities were no longer taking chances and had advised the people to seek a place that was more safe. The scenes at the depot were beyond description. It took us sixteen hours to make the trip from Batoum to Tiflis, a trip usually made in nine, but we were delayed by troop trains which had the right of way and were rushing soldiers, ammunition and supplies, all packed in box cars, to Batoum.

Tiflis to Petrograd

We rested up in Tiflis and bought what clothes we needed for our return trip, as all our baggage had been intercepted by the Turks. We left Tiflis for Petrograd via Baku and Moscow. We spent six days and six nights traveling from Tiflis to Petrograd, the first three nights sleeping in our clothes, inasmuch as there was no bedding obtainable on these trains, the government having commandeered all for hospital purposes. This did not add any to the comfort of the trip. I carried a small enameled teapot which I used to fill with hot water for bath purposes, or else to hold tea or coffee at restaurant stations.

When we got to Moscow we had the extreme pleasure of a restaurant car. We feared that our only way out of Russia was to go to Archangel, a port on the White Sea which was being kept open by Canadian ice breakers, sail around the Scandinavian Peninsula and then down the North Sea. All British subjects had to take this trip home, but the American embassy had another route figured out for us which was far shorter and more comfortable. The reason that British subjects had to take this trip was that it was the only safe route for them, and the only route on which the Germans could not hold up their boat.

Back to Uncle Sam's Country

From Petrograd we went to Raumo, Finland, and sailed across the Gulf of Bothnia to Stockholm. From here we traveled via Christiania to Bergen in Norway and then down to the North Sea to Newcastle. We made the last trip that passengers made between Finland and Sweden, and the next day German mines blew up three Swedish steamers near Raumo and stopped all this traffic. On our train going to Raumo, there were 13 coaches of German subjects being sent out of Russia. All windows of the coaches were painted so as to be opaque, and each coach was guarded by a *gendarme*. Of course the North Sea trip made many passengers fearful of mines, but we got to Newcastle safely the day before the German fleet bombarded Scarborough, Hartlepool and other English ports. On our arrival in London, we found the Batoum darkness in even greater measure, as London feared air attacks. Even trains took the precaution to pull all shades if the lights were on, and the locomotives operated without headlights.

Our trip across the Atlantic was without incident. We were six weeks en route, but felt mighty fortunate to have made such a trip, under the strained conditions, without mishap and to have returned to the good old United States where all was quiet and peaceful.

Placer-Mining Law

By A. L. H. Street*

"Float, outcroppings, lodes and abandoned locations, separately or combined, are not sufficient to constitute a 'known lode' within the exclusion of the placer-mining law. To be impressed with such character the lode must, at the time of application for the placer patent, be clearly ascertained and defined, and of such extent and content that it will then, in view of conditions then, justify development and exploitation, and because of which the placer claim is valuable and more valuable than for placer-mining purposes. Subsequent development, however marvelous the results, is immaterial if the lode be not thus 'known' when the application for the placer patent is made. And the reason is that lode outcrops exist everywhere in the mining country. Not one in hundreds develops into a profitable mine. Valueless, no reason exists to exclude them from public grants and patents, and under such grants made and patents issued without excluding them *prima facie* lodes of value do not exist" (United States District Court for the District of Montana, Barnard Realty Co. vs. Nolan, 215 *Federal Reporter,* 996). This decision was announced in a case involving the superiority of a placer patent over lode locations made subsequently.

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Dedication of the New Building of the Mellon Institute

By W. A. Hamor*

The new $350,000 building which will form the permanent home of the Mellon Institute of Industrial Research and School of Specific Industries of the University of Pittsburgh was formerly dedicated on Feb. 26. This building, the gift of Andrew William and Richard Beatty Mellon, of Pittsburgh, was especially designed for the needs of the Institute; it is distinctly modern in every respect and complete facilities are provided for the investigation of manufacturing problems and for conducting industrial research according to the practical system of coöperation between science and industry, founded by the late Director of the Institute, Dr. Robert Kennedy Duncan. By this system, an industrialist having a problem requiring solution may become the donor of a fellowship by providing the salary of the investigator selected to carry out the research desired, the Institute supplying every facility for the work—laboratory space, the necessary apparatus and supplies, library facilities and advice of a staff expert in industrial research, etc.

The new home of the Mellon Institute is a five-story and attic building. The basement contains seven rooms: The main storeroom, the boiler room, the electric furnace room, a heavy apparatus room, a room equipped for low-temperature work, the machine shop and the kitchen. On the first, the main floor, are located the general office, the director's offices, the office of the editorial department, the library, the office and laboratory of the assistant directors, the assembly hall, a special-apparatus room, and a dark-room laboratory. The second and third floors each contain 10 large research laboratories and nine small ones; the fourth floor, which is not finished, will contain an identical number of laboratories as soon as the growth of the Institute warrants its completion. At the present time 23 fellowships are in operation and 40 research chemists are engaged in a study of the variety of industrial problems under investigation at the Institute.

While the Mellon Institute possesses an endowment of its own and has its own Board of Trustees it is an integral part of the University of Pittsburgh. The dedicatory ceremonies were accordingly held in conjunction with the annual Charter Day exercises of the University.

The Production of Phosphate Rock in Florida in 1913 amounted to 2,545,276 tons. At the values set by the Florida Geological Survey, this constituted 90% of the entire worth of the state's mineral output.

*Published by permission of Dr. Raymond F. Bacon, director of the Mellon Institute.

Comparative Hydraulic-Mining Methods

By Lewis H. Eddy*

SYNOPSIS—Practice at the Lorenz and Union Hill placer mines are compared. The Lorenz has to elevate to the flume and stack the tailings, while the Union Hill has grade at the gravel entry and discharges tailings by gravity. Riffles are different at the two mines. Costs of flumes are given and a general comparison made.

Comparison of the methods of hydraulic mining of placer ground at the Lorenz and the Union Hill mines in Trinity County, Calif., is interesting because of the essential differences in gravel formation and topographical situation affecting their operation. Lorenz mine is situated two miles south of Weaverville on the east side of Weaver Creek, and owned and operated by J. N., W. D. and G. C. Lorenz. Union Hill mine is situated three miles farther south and is one-quarter mile north of Trinity River. It is owned and operated by the Trinity Consolidated Hydraulic Mining Co., D. W. Shank, manager. The mines were not operating at the time of my visit in the middle of November, so my observations were confined to such details of practical methods and costs of construction as could be gained from preparations for the beginning of the fall season, which at both mines include proposed improvements of flume riffling-blocks.

Lorenz Gravel Elevated

The Lorenz ground is so situated along the bank of the creek that the gravel must be elevated to the flume and the tailings stacked well away from the end of it. Union Hill ground has a down grade to the head of the flume, and the gravel is carried by the flume through a tunnel to Trinity River. A portable flume is necessary at the Lorenz and a stationary flume is permitted at the Union Hill. The Lorenz equipment requires six giants and permits the constant use of one or two, according to the amount of water available, for piping in and requires one for stacking tailings, while three giants are used for moving the gravel toward the head of the flume. The Union Hill equipment requires only four giants, one or all of which are used for piping in, according to the supply of water. Lorenz flume is 168 ft. long. Union Hill flume is 1300 ft. long. These are the essential differences between the two mines.

The Lorenz placers lie in a narrow strip between the Weaverville-Lewiston wagon road and Weaver Creek and have an average depth of 20 ft. from surface to bedrock, which is only about 6 ft. higher than the bed of the creek. The ground is so situated as to necessitate working up stream, the depth of the deposit increasing as the elevation of the creek bed increases, so that the deposit at no great distance up stream reaches a depth of 30 to 40 ft. Five hundred inches of water are taken from Brown's Creek, through a six-mile ditch, and passed through a 15-in. pipe 150 ft. long, and taken into the giants under 250-ft. head. The giants are supplied by 24-, 22- and 18-in. pipe and require a total of 3000 ft. of pipe. There are two 11-in. giants, using 4-, 5- and 5½-in. nozzles and four 9-in. giants using 3- and 4¼-in. nozzles, according to various conditions of the gravel, the volume of available water and the situation of the giants. The giants are so placed that one or two may be used for piping direct into the flume, while three others are used for moving the gravel to a position ready for piping in. One giant is placed at the tail end of the flume, which is used only for stacking the tailings along the bank of the creek.

The flume is 168 ft. long, composed of 14 removable boxes or sections and is placed crosswise of the strip of ground to be worked, the head toward the wagon road and the tail toward the creek, but not reaching it. The surface ground or light overburden covering a plot of ground to be worked is first blown off with giants and the pay gravel along the creek side elevated to higher ground before the regular operation begins and the stacking of flume tailing is necessary. The giants used for moving the gravel forward for piping in are so situated that the gravel moving toward the head of the flume approximately describes an arc. Two giants are used for piping in when there is an abundant supply of water, the amount of water used varying from 600 to 700 in. The amount of gravel moved through the flume approximates 500 cu.yd. in 10 daylight hours; the value runs from 10 to 20c. per cubic yard.

The tailing piles are so placed that they serve as a wall against an overflow of creek water to the dredging ground. The waste water from the flume and the light mud that washes through the flume are disposed of through a ditch about four ft. wide cut into the bedrock at a grade of ½ in. to the rod and running parallel with the creek. When a piece of ground has been worked out, the flume boxes are disconnected and set up in another position on the unworked gravel from which the overburden has been removed, and the operation is repeated. The boxes composing the flume are built on sled runners so that a four-horse team may be hitched to it and the box hauled to any point desired for reassembling the sections. The giants are also moved to the proper positions for elevating and piping in the gravel.

Flume Construction

The construction of flume boxes is simple. They are 12 ft. long, 4½ ft. wide and 4½ ft. deep. The sides and bottom are of 18x1½-in. flume lumber; the frames of 4x4-in. pieces for the sides and 4x6-in. for the bottoms. The frames are bolted and the sides nailed. Sled runners, to which the frames are bolted, run the full length of the boxes and are beveled or rounded at both ends so that the boxes, when disassembled, may be hauled either forward or back. The bottoms of two boxes when assembled make a close even joint; the sides are lap-jointed and so attached that when the full complement of boxes necessary for the desired length of flume are assembled and made fast the whole structure is sufficiently watertight and compact and is capable of withstanding great strain. The

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force of the water and gravel at the head of the flume, as it is piped in, is so great that it is necessary to line the box at the head of the flume with iron plates 6 ft. long, 2 ft. wide, ½ in. thick. The corners formed by the joining of the sides and bottom of the box are also protected with 3x6-in. angle iron ½ in. thick and 6 ft. long. The bottoms of the flume boxes are covered with blocks 11x11 in. or 18x18 in. square and 10 in. deep. The blocks are set in rows across the box, 2 in. apart; 2x2-in. wooden riffles are placed at the bottom of the box between the rows of blocks. The flume is set at a grade of 7 in. to the 12-ft. box.

This type of flume may, of course, be extended to any desirable length, or shortened to meet the requirements of narrower strips of ground to be worked. It has been found desirable, however, to reduce the size of the riffle-blocks for flumes as short as this one, made up of 14 boxes. It is also believed to be better practice to use stronger material than wooden blocks. Lorenz brothers have decided upon an experimental installation of one box or more provided with angle-iron riffles. This was in course of construction at the time of my visit, though I was denied the opportunity to observe the practical application by the delay of the anticipated rain. The material to be used for these experimental riffles consists of 3x6-in angles, ½ in. thick and 4½ ft. long, fastened to 4x6-in. wooden pieces 4½ ft. long, and set in the bottom of the flume box, two inches apart. This will give a smooth and even surface for the flow of the water and the passage of the gravel and provide a solid iron corner against the attack of the gravel and water. The item of breakage will have to be taken into account and it may be necessary to substitute steel for iron.

So far as I am aware Lorenz brothers are the only hydraulic miners who in California have adopted the practice of elevating gravel with giants and building flumes in portable sections of the type described. They have installed a similiar hydraulic plant in Alaska. They are probably the first also to contemplate the use of angle iron for riffles, though steel plates and channel iron are in course of experiment by other operators. It is probable that the coming hydraulic season in California will introduce some valuable experimental installations and a number of improved details of practical hydraulic mining.

Two other items of practical detail were noted at the Lorenz mine. One is a pipe sleeve used for connecting two sections of pipe. The upper end, which receives the water, is provided with a steel ring, 2 in. wide and ⅜ in. thick, is covered with a rubber or canvas band about 4 in. wide and fitted inside the sleeve. When the full volume of water passes through the pipe and into the sleeve, the portion of the canvas band extending beyond the inner edge of the steel ring is forced back and forms a water-tight joint. The other device is not new, but is perhaps applied to better advantage than usual. It is the adoption of the flag principle to the gaging of the water in the supply reservoir. The block placed on the surface of the reservoir is connected to a wire that extends to the dredging ground where a flag is attached. The flag rising or lowering indicates the rise and fall of the volume of water in the reservoir, and in the practice employed at this mine of working two giants for piping in when the water is abundant and reducing to one giant when the water is low, the arrangement of the flag signal within close view is of great economic advantage, permitting the change to be made quickly.

Union Hill on Flat Ground

Union Hill placers, comprising about 1000 acres, are situated on a flat that slopes toward Trinity River to the south and Weaver Creek to east. A hill intervenes between the placers and the river, necessitating a tunnel 1300 ft. long through which the flume carries the water and tailing to the river. Water for washing the gravel is delivered through a ditch carrying 2700 in. of water from Grass Valley Creek. The intake is 5 miles east of the mine in a direct line, but the ditch is 12 miles long, owing to the hills that intervene. The penstock is siutated on a hill above the mine. Two pipe lines deliver the water to the mine. One is composed of 1400 ft. of 26-in. pipe connected to a double line of 15-in. pipe, and under a pressure of 450 ft. The low pressure, 250 ft., is composed of 1200 ft. of 30-in. pipe connected to a double line of 15-in. pipe. Four giants are used and about 4000 ft. of pipe for mining. Approximately 800,000 cu.yd. of gravel was removed through the flume last season.

The deposit is formed in an ancient river channel, and composed of three benches, 160 ft., 100 ft. and 90 ft. deep. The situation of the ground and the composition of the formation is such that the operation of the mine requires the stream from the giants to be so directed against the bank as to form a current which constantly carries the gravel across the flat bedrock toward the bedrock ditch leading to the flume. The bedrock ditch varies in width from 4 to 20 ft. and is formed by the wearing of the moving gravel on the bedrock.

Flume Laid in Tunnel

The tunnel through which the flume is laid is 8 ft. wide and 8 ft. from floor to roof, allowing 18 in. on each side for convenience of workmen in repairing the flume and putting in new blocks. The tunnel is about the same length as the flume, 1300 ft. The grade of flume for the first 700 ft. is 3 in. to the 12-ft. section and for the remaining 600 ft. the grade averages about 5 in. to the 12-ft. section. The proper grade would be 7 in. to the 12-ft. box, but the fall from bedrock of the channel deposit to the river is insufficient to permit this grade.

The flume is 5 ft. wide, 4 ft. 6 in. deep and composed of 108 boxes or sections, each 12 ft. long and permanently joined. The frames are made 1½x6-, 1½x4- and 4x5-in. pieces; the sides and bottoms of the boxes are of 1½ in. flume lumber. Riffle blocks are 12 in. deep and 11x11 to 18x18 in. surface, set on end in rows across the box 2 in. apart. Riffle sticks are 2x2 in. by 5 ft. long placed on the bottom of the box between the rows of blocks. The boxes are lined with 2-in. spruce plank, one plank 10 in. wide, the other 6 in. wide. These are renewed at intervals of about three years. Total lumber used in construction of one box, 500 ft., b.m., for frames, bottoms and sides, and 525 ft., b.m., of blocks. The cost for one box is, lumber, $16, blocks, $9 construction, $10; a total of $35, or approximately $4000 for the entire flume, including nails and extra labor required for handling and placing. The lumber is sawed in the vicinity of the mine and costs $32 per M. for siding and frame lumber and $17 per M. for blocks, b.m. laid down at the mine. The flume cost at the Lorenz mine is estimated at $20 per

box or section, due not wholly to the smaller size of the Lorenz boxes, but practically to the fact that Lorenz brothers own and operate a saw mill and do their own construction work. The costs of lumber and construction under the same conditions would be approximately the same.

The cost of pipe is an important item in hydraulic mining in this region, due to necessary wagon haul of approximately 60 miles from Redding, the nearest railroad station. The cost stated by Mr. Shank is: 26-in. pipe, $2 per ft.; 15-in. pipe, $1.15 per ft., laid down at the mine. Mr. Lorenz segregated the price of the pipe and the freight. Cost at Sacramento: 26-in. pipe, 90c. per ft.; 15-in. pipe, 59c. per ft.; freight, Sacramento to the mine, including 169 miles to Redding by rail and 58 miles wagon haul to the mine, 2c. per lb. Total cost is the same as at Union Hill.

Channel Iron Used for Riffles

Mr. Shank has decided to experiment with channel iron as a substitute for wooden riffle blocks. Owing to the greater length of the Union Hill flume a greater width of surface between riffles than in the Lorenz flume is considered essential, so that 12x8-in. or 18x12-in. channels will be used for the experiment. The preference for channels over angles for the initial installation is based largely on economy of construction. The same wooden riffle blocks may be used for holding the channels as are now in use, as the channels are to be 5 ft. long extending across the width of the flume. Besides this, the channels may be reversed when the side and corner receiving the force of water and gravel become worn, upon the theory that the top surface of the channel iron will equal in wearing life the two sides and corners. Should the experiments warrant, the Union Hill and the Lorenz flumes will be fully equipped with channels or angles. The cost of full installation can not be well calculated at present; but in general terms the change has been considered an economic improvement at least worth the small cost of initial equipment of one or two boxes. These experiments will be well worth watching by hydraulic miners whose properties are situated like the Union Hill or the Lorenz. The geographical situation of the two mines, only three miles apart, and the essential differences in deposit and methods of operation will lend interest to the experiments.

Mining Trinidad Asphalt*

Trinidad asphalt from the lake or deposit near Brighton, Trinidad, B. W. I., has been mined on an increasing scale for 35 years. It is only in comparatively recent years, however, that the operation has been placed on a thoroughly efficient basis. To facilitate transport of the asphalt from the lake to the vessels in which it is shipped to the United States, Europe and South America, narrow-gage tracks are run out upon the lake on long ties which, notwithstanding the semi-solid condition of the asphalt, support the track without difficulty. The asphalt, which has a semi-conchoidal fracture, is flaked out of the deposit with mattocks and placed in skips holding about 500 lb., on the railways just mentioned. The asphalt weighs about 75 lb. per cu.ft. Cars, sometimes in trains of 8 or 10, are then hauled to a terminal at the edge of the lake, where they are placed on a cableway, about a mile long, supported by steel frames, and conveyed to steamers at the end of the Brighton pier. Although the asphalt readily flakes out of the lake, it quickly amalgamates in the steamer and upon arrival at its destination must be again "mined" out of the steamer's hold.

Asphalt Mining on Trinidad Island

Natives digging asphalt from the lake bottom. The pier at Brighton and the cableway from the lake to the end of the pier

The composition of the crude asphalt is roughly as follows: Water 29%, soluble bitumen 39%, mineral matter 32%. The Trinidad deposit covers about 114 acres, and as far as exploration drills have been run they indicate that the depth is at least 135 ft. The material is absolutely uniform in all parts of the deposit. The reason for this is undoubtedly that the Trinidad lake is not an overflow of petroleum, in the sense of being an oil seep. It occurs in the bowl of a huge mud volcano. The petroleum is forced upward from the lower point of this bowl and is at or near this point mixed with extremely fine mineral matter in uniform proportion.

*From information furnished by the Barber Asphalt Co.

The Mining Industry in Uruguay

By Rolf Marstrander*

The Republic of Uruguay has been studied but little by geologists and mining men. Only a few scattered descriptions and observations by travelers are at hand, and little systematic prospecting has been done. In the last few years, however, a change has taken place. The Instituto Nacional de Agronomia, created a few years ago, has a chair of geology occupied by an able man, and about two years ago the Instituto de Geologia y Perforaciones was created with the object of increasing the knowledge of the mineral wealth of the Republic.

Exploration by Drilling

The drilling department has nine drills consisting of diamond, percussion, combination and shot drills of varying capacities. Both this and the geological department of the institute have been working in various parts of the republic for about 1½ years. To date two bulletins[1] have been issued, and several others are in preparation and will be published within a short time.

Up to the present, metal mining has not been of importance in Uruguay. A few companies have been formed and have carried on work but, almost without exception, they have not been successful, due in great part to lack of capital. Another cause contributing to the meager development of the mining industry has been the insignificant amount of information available concerning the mineral resources and the small amount of prospecting work done. A short description of the most important mines follows:

The oldest mines, and the only ones worked continuously for any long period, are the gold mines at Cuñapirú, situated in the Department of Rivera, in the northern part of the republic. The first company started work there in 1869. Since that time the mines have changed hands many times, being operated by Uruguayan, French and English companies at various times. The last company (English) sold all its holdings in October, 1913, and at present only a small amount of prospecting work is being done by the owners.

From 1894 to 1913, the yearly production has averaged 11,400 tons of ore carrying 5.7 dwt. of gold per ton. The largest production was 26,000 tons, the highest yearly yield 9.2 dwt. per ton and the lowest was 2.4 dwt. The plant of these mines at Corrales comprises: Two rock breakers, 60 stamps, two tube mills, 12 amalgamators, two cones and six open cyanide tanks with a capacity of 30 tons each. An aërial tramway, about 11 km. long, connects the plant with the mines.

The ore occurs in quartz veins intersecting dioritic rocks. The mineralized ground extends over a vast region in this part of the country, but trained men and careful examination are necessary to detect the payable ore. Lack of water in some instances threw serious obstacles in the way of the work.

Other gold mines in this district are the Zapucay and Samuel Blixen mines, both in the Department of Rivera, the latter is operating on a small scale at present.

At Soldado, in the Department of Minas, there exists another auriferous zone where gold and copper have been extracted from numerous pyritiferous and cupriferous zones. Many assays show an astonishing content of gold and copper, some yielding as high as 4 oz. 6 dwt. gold and 20% copper. These high-grade assays may be ascribed to samples taken from the zone of sulphide enrichment from which practically all the ore mined has been taken. The Spaniards are said to have been the first to work these veins. In 1854 a Uruguayan company started, but soon abandoned the mines. In 1909 another company resumed work on an estimate of 8% copper and 3.8 dwt. gold per ton as an average. A mill was erected but in 1912 the work was stopped, for lack of capital.

Beside the Soldado mine, only one copper mine has been worked in this country, namely, the Oriental mine in the Department of Maldonado. Considerable work has been done here on two copper veins, containing from 8 to 19% copper and having a maximum width of 2 m. The galleries and shafts are in good condition and comparatively well drained, the mine has not been regularly worked for 30 years.

In the department of Rivera, near the gold mines, there exists a large iron-manganese deposit, containing about 35% iron and 23% manganese. It is estimated that nearly 80 million tons can be taken out by opencut. The mine is owned by the Uruguay Manganese Co. A branch railway line is projected to the main line leading to Montevideo. Much development work has been done. Other deposits of iron-and-manganese ore exist at Carrasco, Montevideo, with 30 to 40% Mn; at Piedra del Gigante, Department of Minas, hematite and magnetite; at Santa Lucia in the same department, hematite; and at Cerro Mulero, Department of Treinta y Tres, magnetite.

At Las Conchillas, Department of Colonia, near La Plata estuary, talc of excellent quality has been mined for the last seven years. The total production has been 7000 tons, the greater part of which is shipped to Buenos Aires. The mineral is worked by opencut and is milled and treated at the mine.

Quarrying Industry Most Developed

The quarrying industry in Uruguay is at present far more important than metal mining as there are many beds of granite and marble of fine quality. Most of the granite quarries are situated along the south coast, especially in the Departments of Colonia and Maldonado, the most important being the Minuano quarry at Sauce, Department of Colonia, and the quarry at Piriapolis, in the department of Maldonado. The latter was greatly enlarged and improved in 1914. Modern Swedish stone-cutting machinery capable of producing 32,000 paving blocks per day has been installed.

The largest quantities and best qualities of limestone and marbles are found in the eastern departments in the crystalline schist formation extending over large areas there. In spite of the large consumption of marble as building stone, both in Uruguay and in Argentina, all deposits are at present exclusively worked for the production of lime and for cement manufacture.

As to oil and coal, probabilities of their existence are present and the Instituto de Geologia y Perforaciones is carrying on investigations in the eastern and northeastern parts of the country; peat investigations are likewise to be be started in a systematic way all over the republic.

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[1]Bull. No. 1. "The Marbles of the Carape District;" Bull. No. 2. "The Mineral Resources of Uruguay."

The Cost of Cyaniding*

By Herbert A. Megraw

SYNOPSIS—The cost of cyanide treatment of an ore depends upon so many factors beyond control of the operator that no comparison of efficiencies can be founded upon it. Ore character, geography and plant equipment are among the principal points of difference. A table of cyaniding costs at some of the world's principal mills is appended.

The cost of cyaniding various ores is as different as the ores themselves or as their geographical location. The sum total of cyanide-treatment cost depends upon so many different factors that as a basis of comparison of plant efficiencies it is about as useless as any factor could possibly be.

Effect of Crushing and Grinding on Cost

Possibly the first factor upon which the cost of cyaniding depends is the hardness or toughness of the rock itself. Obviously a soft rock will be put in condition for cyanide treatment at a much lower figure than a hard, tough rock, and there will be a series of different costs for all the gradations between extreme amenability to mechanical reduction and extreme resistance to the same agency. The power will be different in each case, as will also the maintenance cost, expressed in terms of the cost of iron or steel consumed in the crushing operation.

The next factor of importance is the character of the ore itself—the character of its mineral composition, which affects the rate of dissolution of the metal in cyanide solutions, and therefore introduces a factor of cost difference which no ingenuity can avoid. There is also another factor depending upon the physical character of the ore, aside from its resistance to crushing. This is the kind of pulp formed after the ore is ground to the required fineness. Some ores produce a large quantity of colloid material, or slimes as they are usually called in cyanidation, while others reduce to a granular product to a great extent. It may easily be possible, and usually is quite true, that slimes and sands cost different amounts to treat, one class being in most cases considerably cheaper to handle than the other. If the two products are to be treated separately, a large preponderance of the more expensively handled material will make a higher total cost, while on the other hand if the material is all to be treated as sands or all as slimes, the cost of producing that uniform product may be high in some cases and low in others.

Cost of Transportation as a Factor

The geographical location of a plant has a great deal to do with cost, since transportation will not only influence the installation cost of a plant, and consequently its depreciation, but will also influence the cost of all its supplies and all its products. Transportation is a point that has to be given most careful attention, since it may easily make the difference between a profitable and an unprofitable operation.

Aside from the transportation influence, the geographical location of a plant has an influence upon cost in that the supply of labor is apt to be different, even in the same country, while in different countries and dealing with different nationalities the differences are so great as to be altogether incomparable. All of these matters have, however, been spoken of previously in this series of articles, and no useful purpose will be served in bringing them up again at this point. The cost of the detailed operations in cyanidation has also been discussed, so that since the total cost of cyanidation is simply the addition of all the detailed costs, all that remains to be done at this point is to discuss the costs in general and show in a broad way, if possible, upon what they depend.

In considering the cost of cyaniding, one usually considers all the mill operations, beginning with rock breaking, crushing, regrinding, and continuing with the operations necessary to complete the treatment, including concentration and amalgamation, if these are part of the milling system. It is, of course, perfectly clear that all of these items are not cyaniding proper, but since by "cyaniding" we usually mean the total milling operation in which the cyanide process is used, and since all the processes which precede and follow actual cyaniding are designed to be an assistance in the process, to promote its efficiency and to make it deliver a higher extraction or effect a reduction of cost, they must all be considered as vital parts of the system. Cost of cyaniding cannot be limited strictly to the dissolving of the metal in cyanide solution and its precipitation afterwards, but must include all the processes which have effect upon the actual dissolution of the ore.

Influence of Machinery Types

Among the practices which exercise a strong effect upon ore treatment are the methods of breaking, crushing and grinding. Usually jaw or gyratory type breakers are used for the first rock reduction, followed by stamps, rolls, chilean mills or perhaps some other form of intermediate crushing machines. Of all of these types, the stamp may be regarded as the most expensive on all ordinary ores, although on exceptionally tough ores it may be somewhat cheaper than other machines, due to the less destruction of iron per ton of ore milled. On ores of medium toughness rolls may be used with good effect, or a ball mill of any of the several types now in general use for the purpose may be used. These machines perform a reduction from coarse rock, which will pass a 1½- or 2-in. ring, down to a size appropriate for tube-mill feed, approximately a maximum size of 10 mesh, or perhaps up to ¼ in. Chilean mills, of either high speed or low speed, will also perform work of this class, and the slow-speed mill may be considered somewhat cheaper as to power consumed and wear and tear on the grinding parts, though its installation cost is somewhat higher since it does not have the large capacity of the high-speed mills.

*This is the twentieth and last of a second series of articles by Mr. Megraw. Preceding articles of this series appeared in issues of Sept. 6, Oct. 4, Nov. 1, Nov. 15, Dec. 20, 1913; Jan. 31, Mar. 7, Mar. 21, Apr. 25, May 23, June 20, July 25, Aug. 29, Sept. 12, Oct. 17, Oct. 31, Dec. 5, Dec. 26, 1914, and Feb. 13, 1915.

The cost of this intermediate crushing process, then, will depend altogether upon the nature of the ore itself. An extremely hard, tough ore will probably require the use of stamps to bring it satisfactorily to a size for regrinding, if regrinding is followed, while a medium or soft ore can be handled in some one of the cheaper machines, the machine most available depending upon the kind of ore to be reduced.

Separate-Treatment Plants

Regrinding is not always followed. After the intermediate-crushing process cyaniding may be immediately undertaken without any further reduction of the ore size. In this case, it is usual to divide the pulp into two classes, to be called sands and slimes—sands to be leached in open tanks and slimes to be treated by agitation. Sometimes only leaching is resorted to, the slimes being discarded or saved for future treatment. In this case the reduction process is likely to be extremely cheap, since leaching is cheap and requires little labor and little installation, and consequently necessitates only a low maintenance cost. If slimes are to be treated too, the cost will be somewhat higher.

If the pulp, however, is to be treated as a total slime, then the cost is higher on account of the agitation required, and also because of the interest upon the more expensive installation made necessary by the conditions. Added to this, there is the cost of reducing the ore to a total slime; that is, taking the sand product from the intermediate crusher and reducing it to a fineness such that it may be all treated in agitation tanks. This usually means passing all of the material, or much the greater part of it, through a 200-mesh screen. The operation is usually performed in tube mills and is a factor which adds materially to the cost of the operation in total. Crushing and grinding costs have already been referred to in this series of articles, and reference to the data will show the comparative cost of the different methods of reduction.

Between the intermediate crushing and fine grinding operation there comes the process of classification, which means the separating of the oversize material requiring further grinding from the slime or portion which has already been reduced to the fineness sufficient for agitation methods. Classification may be carried out in several machines and by several methods, and each of them will have a different cost. Probably the principal apparatus used for classification is the Dorr classifier, while others which may be mentioned as efficient and satisfactory in many cases are the Akins, Esperanza, Ovoca and several other types of mechanical separators. Besides these there are the cone classifiers, which may be simple separating cones, or cones with the Caldecott diaphragm. All these machines are efficient under special conditions, and the cost of operating each of them will probably be different in any case. Study must always be made of the proper applications of any machine, and classification is no exception to this rule. The use of any particular means in any special case will provide a cost of operation which may be, or may not be, reduced by using some other machine, the finality depending upon the care with which the selection was originally made.

Leaching and Agitation Costs

If leaching is to be adopted, there is not much chance of a cost change except in the provision of material of proper fineness. Various degrees of fineness will cost various amounts for their production, so that the cost of leaching a material of any particular fineness will have to be worked out for each case. When agitation of slimes is considered, however, there are any number of different methods of doing it, all of which have a material effect upon the final cost. The various agitating devices, such as the Pachuca tank, the Hendryx agitator, the Patterson agitator, Dorr agitator and dozens of other devices which have been suggested for the purpose, all require different degrees of power and maintenance costs, and work with different efficiencies. Their total cost will differ materially. In agitation not only efficiency has to be taken into account, but power consumption, durability and the ability to operate for long continued periods of time without plugging up. If an agitator is liable to stoppage, it will have to be dug out every once in a while, and the cost of doing this work must be added to the cost of operation, which will be likely to run the cost figures up materially. The cost of agitating a sandy ore will differ very much from that required for agitating a pure colloid, so again the physical condition of the ore has a large effect upon the ultimate cost of treating it.

Proceeding from the agitation department, when slimes are treated there are other processes which have an appreciable effect upon the cost of the system in general. Pulp thickening, for instance, may be performed either in cones of the Callow type or plain cones, or in Dorr thickeners. The process used, if any, will have an effect upon the total cost. The filtering operation, the final one in the cyanide treatment of ore, will have great importance upon the ultimate cost. As has already been set forth in the chapter on filtering in this series of articles, each system has an entirely different cost factor, both for operation and for installation. The leaf filters of the vacuum type have a high operation cost and a high installation cost. The pressure filters of the leaf type may be considered somewhat more economical in both departments in many cases, although not in all. Again the plate-and-frame type of filter may be used, either in its original form or with the Merrill improvement, which materially reduces cost of operation. Depending upon the quantity handled, either of the systems may be used under proper circumstances. Another alternative is the counter-current decantation system as proposed and designed by Dorr, which avoids the use of any filter at all, accomplishing the washing result by successive decantation of low-value solution or water. This system is used in many cases, and assists in reducing the ultimate cost of the cyaniding operation.

Economy of Precipitation Methods

The method of precipitation will have some effect upon the ultimate cost also, since the zinc-dust method, as applied by Merrill, will have numerous advantages in many cases over the zinc-shaving method formerly widely used. Aluminum dust is also sometimes used as a precipitant, notably at the plant of the Nipissing Mining Co., Cobalt, Ont. All of these systems will have an effect upon the cost of cyaniding operations, and each will probably provide a minimum cost in different cases. In addition to the various methods of operation, it is of course obvious that the scale of operation will have a vital effect upon ultimate cost. In general it may be said that the greater

the scale of operation, the lower the cost, although this does not always hold true since large operations may be carried on at isolated or remote locations, and under labor conditions which make the total cost excessive. Granted that other conditions remain the same, however, it may be said that the greater the scale of operation, the lower the total cost.

In comparing costs of cyaniding, or any other operation in the mining field, it must be fully and carefully and constantly borne in mind that the cost figures afford no basis for comparison of efficiency, economy or intelligence in plant operation. No two plants can be compared unless all conditions are absolutely identical, which never obtains in actual practice. While a notation of costs obtained in various mills may be enlightening as to the limits within which cyaniding can be performed under various conditions, the comparison of these costs among themselves must not be considered as representing efficiency.

Cost Figures at Different Mills

The accompanying table of the cost of operation at various cyanide plants will give a general idea of the limits within which the process is carried on. Those interested in the cyanide process will realize that these plants are of different size, working on different ores, located in different parts of the world, near and far from railroad communication, and in general working under every conceivable combination of circumstances. Naturally the costs are widely different. The first plant, the Tom Reed, of Arizona, is remote from a railroad, in a dry and rugged country, and therefore its costs are comparatively high. The next plant mentioned, Stratton's Independence, of Cripple Creek, Col., is working on a large scale in a camp amply supplied with railroad and other communications, using a cheap method of crushing and concentration, ably managed, and working on a gold ore, which is of course cheaper to treat than silver, due to the difference in the volume of metal extracted. Its costs are noticeably low. Most of the Tonopah mills are mentioned, and it will be seen that there is no great difference between their costs when it is considered that the higher costs are at the older mills and that some of the figures given include administration costs.

As has been said, it costs much more to treat a silver ore than it does a gold ore. Silver does not occur native, but in complex minerals, and the volume is very much greater than is the case where gold is treated. The Pittsburgh Silver Peak mill has a low cost, because it works a medium-grade gold ore on a comparatively large scale and by a simple process; that is, leaching the sand and treating the slime in Merrill filter presses. The Homestake treats for a low cost on account of its enormous working scale. The Wasp No. 2 treats cheaply because of the simplicity of the process, which is simply roll crushing to coarse mesh and leaching. It also operates on a good scale—500 tons per day. The G. C. & C. costs are introduced simply to show the approximate cost of leaching accumulated tailings by a simple process. In this case there is no crushing or grinding to be accounted for, and the whole operation is conducted on a temporary basis.

At the Dome and Hollinger mills in the Porcupine District, the costs are based on large-scale treatment of medium-grade gold ore in a cold country. It may be mentioned here that the costs in a cold country are somewhat higher, due to the necessity of heating the mill in winter time during the severe weather. At the Nipissing mill, Cobalt, a highly complex ore is treated by a specialized system with which all cyaniding engineers are at the present time undoubtedly familiar.

Among the Mexican mills, a great difference in cost will be noticed. At the Dolores, for example, costs are high, due to the isolated locality of the plant, which is several days by trail from the nearest railroad station. El Rayo is also isolated, and therefore its costs are also high.

At the Central American plants there is also a great difference in cost, a good deal of this difference depending upon the character and quality of the labor used. In the Orient, costs are low, due to the exceeding cheapness of the native labor. On the Rand the costs are low, since upon most of the ore separate treatment is employed, regrinding for total sliming being a rarity.

The figures given are compiled from various published sources—technical journals, books, company reports, etc., and are for periods of six months or a year during years varying from 1912 to 1914. The latest reports have been used whenever there has been any choice. No attempt has been made to include all plants, nor most of them, but simply to present enough types to show the general limits within which the work is carried on.

COST OF CYANIDING

United States and Canada

Plant	Cost per Ton Milled
Tom Reed	$3.376
Stratton's Independence	1.310*
Camp Bird	1.830
Liberty Bell	1.500
Goldfield Con.	1.610
Montana Tonopah	3.121*
Nevada Hills	2.830
Tonopah Belmont	2.960
Tonopah Extension	3.290*
West End Consolidated	3.620*
Tonopah Mining Co. (Desert Mill)	2.670
Pittsburgh Silver Peak	1.040
Homestake	0.897
Wasp No. 2	0.630
North Star	0.979
Black Oak	1.729
Consolidated Mercur	1.270*
G. C. & C. (tailings leaching, Eureka, Utah)	0.890*
Motherlode (Sheep Creek, B. C.)	1.400
Dome	2.110
Hollinger	1.490
Porcupine Crown	1.640
Nipissing	2.952
Mexico	
Creston Colorada	$1.690
Dolores	6.000
El Rayo	3.220
Dos Estrellas	1.250
El Oro Mining & Ry. Co.	1.100
Esperanza (El Oro)	1.610
Mexican Mines of El Oro	1.190
La Blanca	1.725
Santa Gertrudis	2.440†
Guanajuato Reduction & Mines	1.350
El Tigre	3.380
Central America	
Abangarez Gold Fields of Costa Rica	$3.640
Aguacate	1.310
Montezuma Mines of Costa Rica	2.350*
New York and Honduras Rosario	3.460*
Lone Star (Nicaragua)	0.990
Siempre Viva (Nicaragua)	0.920
Butters Divisadero (Salvador)	1.690
The Orient	
Oriental Consolidated (Chosen)	$1.630
Three different mills	1.870
	3.180
Mysore	0.829
Nundydroog	0.771
Transvaal	
Aurora West United	$0.960
Meyer & Charlton	1.090
New Goch	0.940
Roodepoort	0.870
Van Ryn	0.850
Knights Central	0.940
Main Reef West	0.996
Simmer & Jack Prop.	0.737

*Includes general expense. †Includes shipping and selling.

Mineral Production of Canada*

The preliminary report on the mineral production of Canada in 1914 shows a total value of $128,475,499, which is a decrease of $17,159,313, or 11.8%, from 1913. This is the first decrease shown in a number of years, and is the smallest total reported since 1911. The first table shows the details of this production.

By provinces Ontario again has the largest output with a value of $52,147,973, or 40.6% of the total, practically the same proportion as in the previous year. British Columbia is second with a value of $24,202,924, or 18.8%; Nova Scotia is third with $17,514,786, or 13.6%; Alberta fourth with $12,773,669, or 9.9%; Quebec fifth with $12,259,637, or 9.5%; the Yukon sixth with $5,402,062, or 4.2%; Manitoba seventh with $2,428,902, or 1.9%; New Brunswick eighth with $1,034,706 and Saskatchewan ninth with $710,840, each less than 1%. A decreased production is shown in each province with the exception of Manitoba and in this case the increase is due chiefly to the operation of the new cement mill near Winnipeg by the Canada Cement Co. and the inclusion of a more complete record of the production of sands and gravels.

MINERAL PRODUCTION OF CANADA

	1913		1914	
	Quantity	Value	Quantity	Value
Copper, lb	76,976,925	$11,753,606	75,738,386	$10,301,935
Gold, oz	802,973	16,598,923	770,374	15,925,044
Pig iron, tons	1,128,967	16,540,012	783,164	10,002,856
Lead, lb	37,662,703	1,754,705	36,337,765	1,627,568
Nickel, lb	49,676,772	14,903,032	45,517,937	13,655,381
Silver, oz	31,845,803	19,040,924	27,544,231	15,097,269
Other metallic products	.....	1,313,732	.....	1,123,919
Total	.....	$81,904,934	.....	$67,733,972
Less pig iron credited to imported ores, tons	1,055,459	15,543,583	687,420	8,863,944
Total metallic	.....	$66,361,351	.....	$58,870,028
Asbestos and asbestic, tons	161,086	$3,849,925	117,573	$2,909,806
Coal, tons	15,012,178	37,334,940	13,594,984	33,433,108
Gypsum, tons	636,376	1,447,739	510,663	1,137,157
Natural gas, M ft	20,477,838	3,309,381	21,047,028	3,511,302
Petroleum, bbl	228,080	406,439	214,805	343,124
Pyrites, tons	158,566	521,181	224,958	735,514
Salt, tons	100,791	491,280	107,038	493,648
Cement, bbls	8,658,805	11,019,418	7,172,480	9,187,924
Clay products	.....	9,504,314	.....	7,090,898
Lime, bu	7,558,484	1,609,398	6,245,189	1,247,517
Stone	.....	5,504,639	.....	5,593,485
Miscellaneous non-metallic	.....	4,274,807	.....	3,921,988
Total non-metallic	.....	$79,273,461	.....	$69,665,471
Grand total	.....	$145,634,812	.....	$128,475,499

The quantity of ores treated by smelters and refiners in Canada in 1914 was: Nickel-copper, 947,053; silver-cobalt, 5661; lead, 71,064; copper-gold, 1,612,197; total, 2,649,935 short tons, a decrease of 387,456 tons from 1913. The first products were 12,238 tons blister copper, 6291 tons copper matte, 46,396 tons nickel-copper matte and 101 tons cobalt material. The metallic contents are given in the accompany table.

SMELTER PRODUCTION IN CANADA

	Refined	In Matte, Etc.	Total
Gold, oz	11,088	170,818	181,906
Silver, oz	11,096,861	873,400	11,970,261
Lead, lb	36,443,706	.....	36,443,706
Copper, lb	.....	59,237,016	59,237,016
Copper sulphate, lb	152,060	.....	152,060
Nickel, lb	.....	45,517,937	45,517,937
Nickel oxide, lb	391,312	.....	391,312
Cobalt oxide, lb	895,789	.....	895,789
White arsenic, lb	3,474,322	.....	3,474,322

Gold

The total production of gold, in placer and mill bullion and in smelter products in 1914, is estimated at 770,374 fine oz. valued at $15,925,044, showing a decrease of $673,879 or about 4%. Of the total production in 1914, about $5,695,508 was derived from placer and alluvial mining; $6,050,690 in bullion from milling ores, and $4,228,846 from matte, blister copper and other smelter products, etc. The production in Nova Scotia and Quebec is small compared with the other provinces but shows an increase of over 25% in 1914. The Ontario production, $5,546,356, shows an increase of over a million dollars due to the extension of milling facilities in the Porcupine field.

No records have been received with respect to gold production in the Beaver Lake district of Saskatchewan or of recoveries from the river bars near Edmonton, Alberta, although activity has been reported in both localities.

The production in British Columbia was $5,177,343, of which $524,000 is credited to placer workings as estimated by the Provincial Mineralogist, and $4,653,343 to smelter products and bullion from milling ores. The Yukon production shows a falling off of $721,384, the total in 1914 being $5,125,396 including a small value in mill bullion.

Silver

The falling off in price of silver amounting to 4c. on the average price for the year, the cessation of price quotations and the difficulties of marketing the metal immediately following the declaration of war restricted operations in the Cobalt camp, causing a lower production than might have been expected under normal conditions.

The total Canadian production in 1914 was 27,544,231 oz., valued at $15,097,269, a decrease of 4,301,572 oz., or 13.5% in quantity, and of $3,943,655, or 20.7% in total value. Of the total production 24,215,926 oz., or 88% is credited to Ontario. The production from the silver camps is reported as 9,614,069 oz. in bullion shipped, and 14,544,524 oz. (after deducting 5% for smelter losses) contained in ore and concentrates shipped from Cobalt district. There is also included in the total a small quantity of silver contained in gold bullion shipped.

The Ontario production in 1913 was 28,411,261 oz. showing a falling off for the province of 4,003,805 oz., or about 14.1 per cent.

In addition to the bullion shipments from the Cobalt camp, 9,052,993 oz. were produced in other silver refineries in the province, making a total of 18,667,062 oz. or 67.7% of the Ontario production recovered within the province in the form of bullion. The production in British Columbia, representing refined silver and silver contained in smelter products and estimated recoveries from ores exported, was in 1914 about 3,212,111 oz. There was a small production in copper ores from Quebec, and in gold and copper from the Yukon.

Copper and Lead

The copper situation in 1914 was marked by an increased production in Ontario and Quebec as against a falling off in British Columbia and the Yukon, leaving the net result as a very slight decrease.

The copper contained in matte, blister copper, etc., produced in Canadian smelters together with the estimated recoveries or amounts paid for in ores exported amounted in 1914 to 75,738,386 lb. There was a falling off of only 1.6%, but, owing to the lower price, a larger percentage decrease in total value.

The production in Quebec from pyrite ores was 4,201,497 pounds.

*Abstract of the Annual Report of John McLeish, Chief of Division of Mineral Resources and Statistics, Department of Mines of Canada, Ottawa.

The Ontario production is derived chiefly from the nickel-copper ores of the Sudbury district and of the Alexo mine, although there is a small amount of copper contained in the silver ores shipped from Cobalt, some of which is paid for. The production in 1914 is reported as 28,948,211 lb., an increase of 3,062,282 lb. over 1913. The Mond Nickel Co. contributed a much larger percentage of the total production during 1914 than in 1913. The British Columbia production was 41,221,628 lb., a falling off of 4,569,951 lb. The Pueblo mine was again the principal copper producer in the Yukon.

The smelter production of lead from Canadian ores in 1914 was 36,337,365 lb., nearly all of it from British Columbia ores, recovered at the Trail smelter.

Nickel

The declaration of war resulted in the almost immediate closing down of a considerable portion of the mining and smelting operations of the Canadian Copper Co. in the Sudbury district, and although they were partially resumed before the close of the year the company's output was greatly reduced. The Mond Nickel Co. on the other hand, having increased the capacity of its smelter at Coniston, nearly doubled its output. Ores from the Alexo nickel mine north of Cobalt were also reduced in this smelter. Ten separate properties were worked by these companies.

PRODUCTION OF NICKEL IN CANADA

(In Short Tons)

	1911	1912	1913	1914
Ore mined	612,511	737,584	784,697	1,000,364
Ore smelted	610,834	725,065	823,403	947,053
Bessemer matte produced	32,607	41,925	47,150	46,396
Copper content of matte	8,966	11,116	12,938	14,448
Nickel content of matte	17,049	22,421	24,838	22,759
Spot value of matte	$4,945,592	$6,303,102	$7,076,945	$7,189,031

The nickel-copper ore is reduced in smelters and converters to a bessemer matte containing from 77 to 82% of the combined metals and shipped in that form to Great Britain and the United States for refining; the product of the Canadian Copper Co. going to New Jersey and that of the Mond Nickel Co. to Wales. A portion of the matte produced by the Canadian Copper Co. is used for the direct production of Monel metal, an alloy of nickel and copper, without the intermediate refining of either metal. There is also a small recovery of nickel in the form of oxide from Cobalt District ores. Details of the production and working are shown in the accompanying table.

Iron Ore and Iron

The iron-ore shipments from mines in Canada during 1914 are reported as 244,854 short tons. These shipments included 199,292 tons of hematite and roasted siderite and 45,562 tons of magnetite and concentrates. Exports of iron ore from Canada during 1914 were recorded by the Customs Department as 135,451 tons. Imports of iron ore in 1914 were 1,147,108 tons, valued at $2,387,358.

The total production of pig iron in Canadian blast furnaces in 1914 was 783,164 short tons, as compared with 1,128,967 tons in 1913. A large portion of this production is used directly in the manufacture of steel and the values are in part estimated. Of the total production in 1914, 9380 tons were made with charcoal and 773,784 tons with coke. The classification of the production, according to the purpose for which it was intended, was as follows: Bessemer 230,817, basic 346,553, foundry and malleable 205,794.

The ore charged to blast furnaces included 182,964 tons of Canadian ore, 1,324,326 tons of imported ore, and 33,583 tons of mill cinder, etc. The amount of coke used during the year was 921,171 tons, comprising 330,269 tons from Canadian coal, and 590,902 tons of imported coke or coke made from imported coal. The quantity of charcoal fuel used was 920,045 bu. and of limestone flux 447,636 tons.

Nova Scotia reported 227,052 tons made and Ontario 556,112 tons.

There was also a production during 1914 in electric furnaces of 7524 tons of ferro alloys (ferrosilicon and ferrophosphorus) compared with 8075 tons in 1913. This production is chiefly 50% ferrosilicon.

Coal and Coke

The production of marketable coal is shown in the accompanying table. Exports of coal for the year were 1,423,126 tons. Imports were 4,435,070 tons anthracite and 10,286,047 tons bituminous.

The total output of oven coke during 1914 was 1,015,253 short tons made from 1,533,365 tons of coal, of which 1,030,053 tons were mined in Canada, and 503,312 tons were imported. The total quantity of coke sold or used by the producers during the year was 1,019,082 tons. The output by provinces in 1914 was: Nova Scotia 345,880 tons; Ontario 377,514 tons; Alberta 28,541 tons, and British Columbia 263,318 tons. The production from Ontario was entirely from imported coal.

COAL PRODUCTION IN CANADA

(In Short Tons)

	1912	1913	1914
Nova Scotia	7,783,888	7,980,073	7,338,790
British Columbia	3,208,997	2,714,420	2,238,339
Alberta	3,240,577	4,014,755	3,667,816
Saskatchewan	225,342	212,897	232,541
New Brunswick	44,780	70,311	104,055
Yukon	9,245	19,722	13,443
Total	14,512,829	15,012,178	13,594,984
Coke made	1,411,219	1,517,133	1,015,253

Byproducts from coke ovens during the year included 8572 tons of ammonium sulphate; 5,714,172 gal. of tar and 3,201,097 thousand feet of gas.

Miscellaneous

The asbestos production in 1914 was obtained from the districts of Black Lake, Thetford, Robertsonville and Danville in the Province of Quebec.

The total output in 1914 was 107,668 tons, a falling off of 24,896 tons, or 18.7%. The sales and shipments of asbestos during 1914 were 96,542 tons. Stocks on hand on Dec. 31, 1914, were 31,171 tons.

The production of petroleum was chiefly from Ontario, the western fields not having reached the stage of commercial production. The total production in 1914 was 228,080 bbl., or 7,518,168 gal. The total production of natural gas was 21,047 million feet, about two-thirds from Ontario and nearly one-third from Alberta.

The year 1914 witnessed a large falling off in the production of nearly all materials of construction. This situation while possibly aggravated by the war was due primarily to conditions which had already begun to show their effects during the latter part of 1913.

The total quantity of portland cement, including slag cement and natural portland, made in 1914 was 8,727,269 bbl. of 350 lb. each, a decrease of 2%. The total quantity of Canadian portland cement sold or used during 1914 was 7,172,480 bbl. The average value at works was $1.28 per barrel.

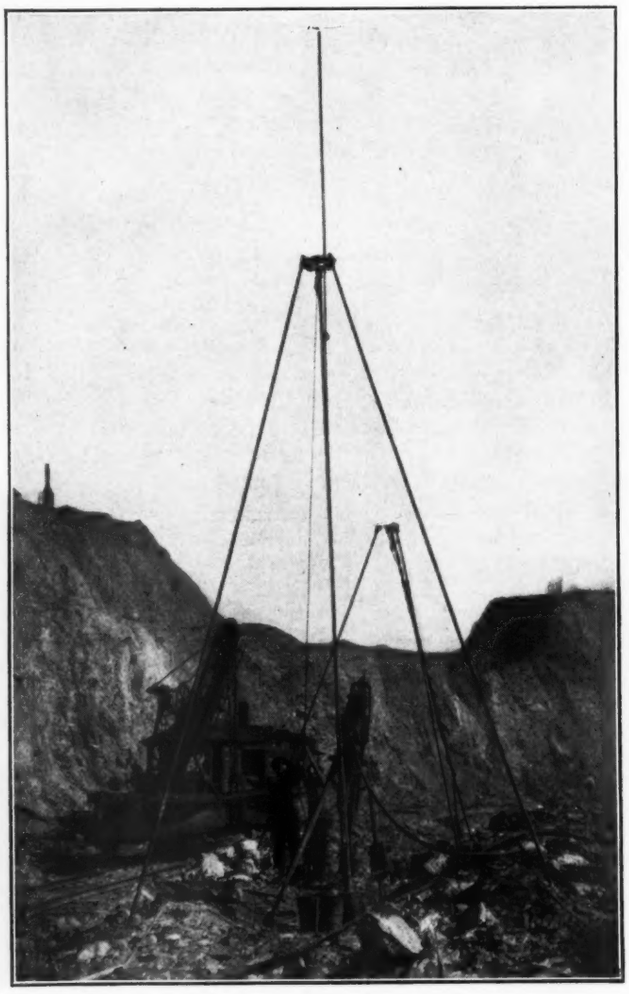
Details of Practical Mining

Tripod for Handling Long Drill-Steel

By Le B. Reifsneider*

The accompanying illustration represents a device we have found useful in handling long pieces of steel when drilling vertical holes up to 35 ft. in depth, using tripod drills.

The device consists of the parts of an old tripod so badly worn as to be no longer safe as a drill mounting.



Old Drill Tripod Rigged with Extension Legs

The usual short pipe legs are removed and replaced with lengths of 1½-in. pipe, the latter being threaded and having a coupling on the lower end for convenience in adding short lengths of pipe when it is desired to increase the height of the rig. An eye-bolt is put into the opening in the saddle and secured there by a washer and nut, and a single block with a ¾-in. manila line rove through it is hooked into the eye-bolt. The line is two and a half times the length of the tripod legs, and at one end a simple straight hook of ½-in. round iron is fastened.

In use the tripod is first laid out on the ground, the front legs are spread to a width that will make a stable base, usually about one-half the height although sometimes less, and all bolts are drawn up and tightened except the nut on the through bolt which holds the rear leg. The block is then hooked into the eye-bolt, the rope rove and the tripod raised and moved over the hole where the machine is drilling, so that the hook on the rope falls approximately over the center of the hole.

In removing a piece of steel from the hole it is first pulled up as far as it can be conveniently handled with the dolly bars, one man then lets go the dolly bar and takes three turns of the hook end of the rope around the steel close to the collar of the hole, fastening the hook back over the rope above the turns on the steel. He then pulls the rope taut and takes several turns around the rear leg of the tripod on which the drill is mounted. As soon as he has done this, the other man lets go the dolly bar and aids the man at the rope to pull the steel up until the bit swings clear of the collar. After this the steel is lowered by paying out the turns of the rope on the leg of the drill tripod. The steel is always handled between the two front legs of the rig, since this gives greater stability.

The illustration shows the regular drill crew of two men raising a piece of steel 35 ft. long, using a tripod 22 ft. high. The rig is used for all steel over 20 ft. in length.

Beside the saving of time and labor in handling the steel this is also a valuable safety device, since by using the drill-tripod leg as a snubbing post the steel is always under control and can be handled safely on a narrow ledge in a high wind.

*Mine superintendent, Spanish-American Iron Co., Daiquiri, Oriente, Cuba.

First-Aid Kit

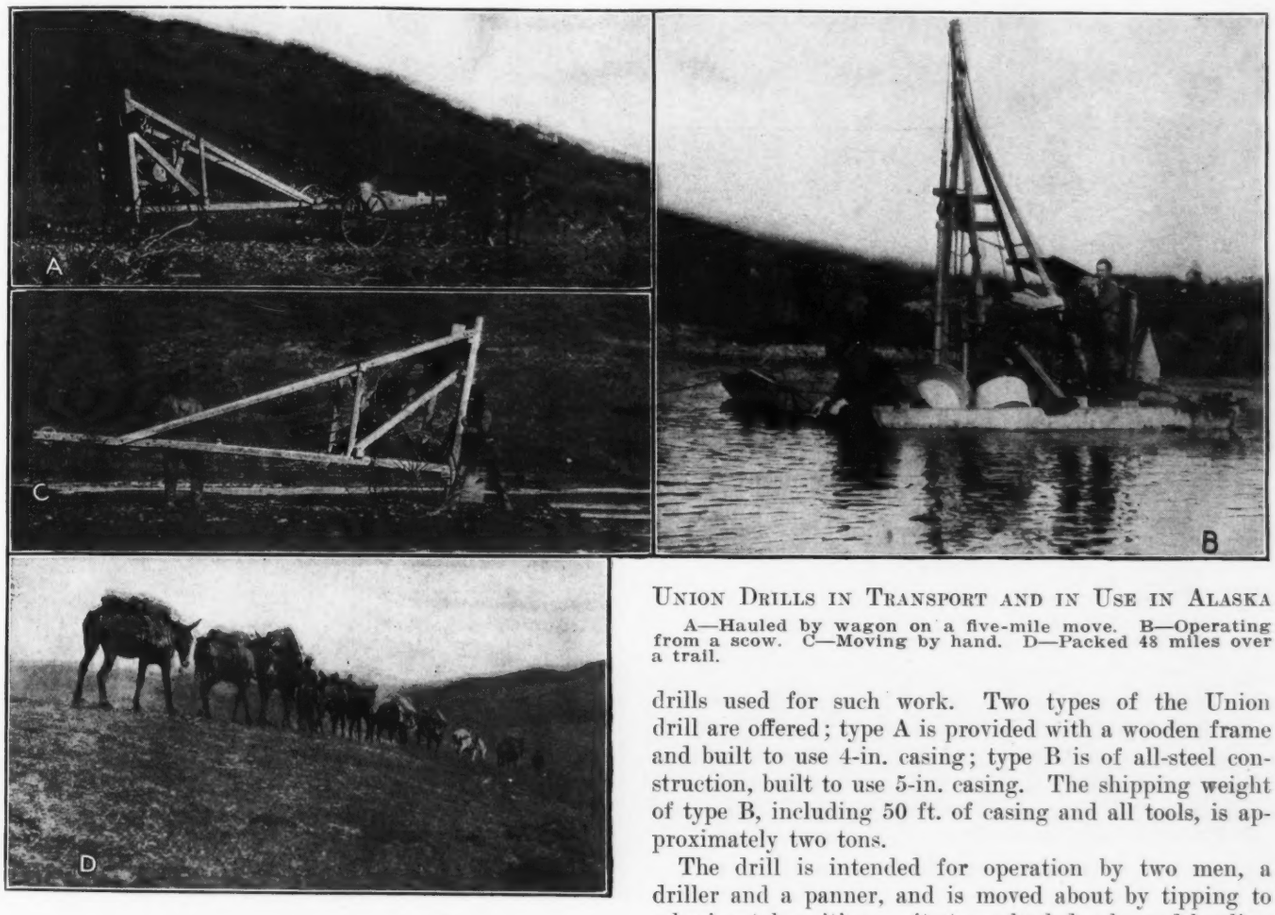
The following is the first-aid kit specified by the Massachusetts factory law:

One 2-oz. bottle of aromatic spirits of ammonia (to be renewed every three months).
One 2-oz. bottle of 4% boric-acid solution.
One 2-oz. bottle of alcoholic iodine.
Two 3-oz. tubes of 3% bicarbonate of soda in petrolatum.
One 3-in. by 10-yd. roll of gauze bandage.
One 2-in. by 10-yd. roll of gauze bandage.
Two 1-in. by 10-yd. roll of gauze bandage.
One medicine glass.
Three drinking cups (paper), to be used once only.
One teaspoon.
One eye dropper.
One pair 4½-in. scissors.
One dozen assorted safety pins.
One 1-oz. jar of green soap, to cleanse hands.

One basin enameled or nonrustable metal.
One-half pint of grain alcohol.
Six paraffin envelopes, each containing 6x36 in. of sterilized gauze, dressings for wounds, burns, etc.
One yard of 24-in. canton flannel, to make triangular slings.
One 1-in. by 5-yd. spool of adhesive plaster.
One rubber tourniquet, 24x½ in., or of webbing about 24x1-in., to control hemorrhage.
Two splints, 30x4x$\frac{3}{16}$-in., whitewood, and one wire-gauze splint, about 30x4 in., for fractures.
The National Founders' Association has adopted the following for its standard package:
One tourniquet.
One pair of nickel-plated scissors.
One pair of nickel-plated tweezers.
Six packages of 6x36-in. of sterile gauze.
One teaspoon.
One metal cup.
Two medicine droppers.
Three paper drinking cups.
First-aid record cards.
This is the outfit to be packed in the jar described in the JOURNAL of Jan. 30, 1915.

Union Portable Gasoline Churn Drill

The Union Construction Co. of San Francisco manufactures a light portable power drill, especially adapted to placer testing and prospecting. This drill is much lighter and more easily handled than the older types of power



UNION DRILLS IN TRANSPORT AND IN USE IN ALASKA
A—Hauled by wagon on a five-mile move. B—Operating from a scow. C—Moving by hand. D—Packed 48 miles over a trail.

drills used for such work. Two types of the Union drill are offered; type A is provided with a wooden frame and built to use 4-in. casing; type B is of all-steel construction, built to use 5-in. casing. The shipping weight of type B, including 50 ft. of casing and all tools, is approximately two tons.

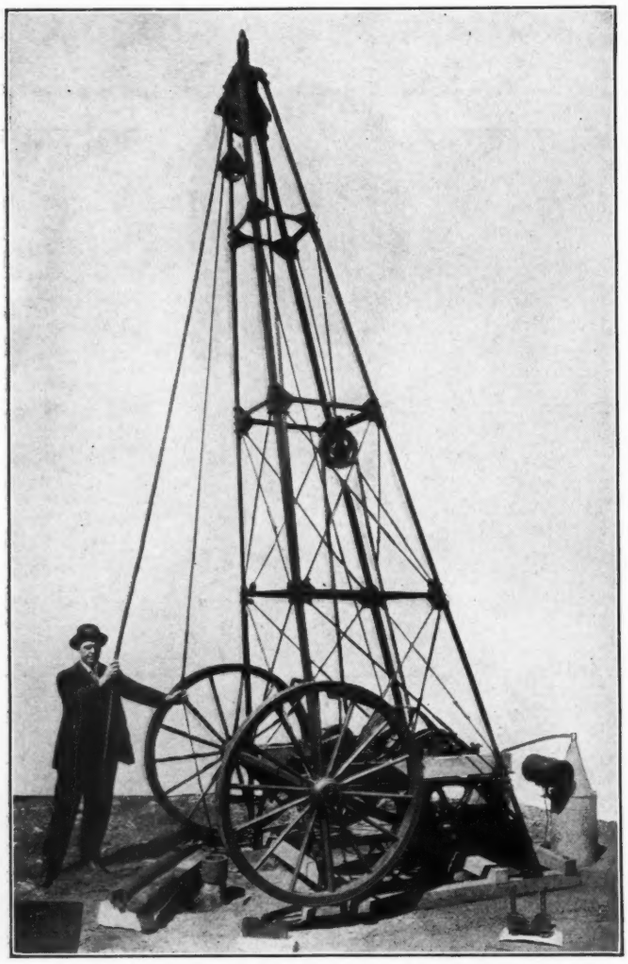
The drill is intended for operation by two men, a driller and a panner, and is moved about by tipping to a horizontal position on its two-wheeled axle, and hauling by hand or by horses. The frame is built of structural steel sectionalized for transportation. All gears and main bearings are of steel. Sheaves are bronze bushed, and the four legs of the frame are well braced with tie rods. Steel channels are used for carrying the spudding gear.

These drills are operated by means of a 4-hp. Cushman gasoline engine, of the four-cycle type, having a speed range of from 350 to 900 r.p.m. The drill has no walking-beam, but is fitted with a slip-shoe friction in the spudding gear. This gives the bit an unimpeded fall. The ordinary speed is 42 strokes per min. and the length of the stroke is adjustable from 24 in. to 36 in. The standard bit weighs 185 lb.; the heaviest single piece of the frame weighs 90 lb. and the heaviest piece of machinery weighs 135 lb. The engine is heavy for its horsepower and has

One triangular sling.
One wire-gauze splint.
Twelve assorted safety pins.
One 2-oz. bottle of castor oil.
Two 3-oz. tubes of burn ointment.
One 2-oz. 3% alcoholic iodine.
One 2-oz. bottle of white-wine vinegar.
One 2-oz. bottle of 4% aqueous boric acid.
One 2-oz. bottle of aromatic spirits of ammonia.
One 2-oz. bottle of Jamaica ginger (or substitute).
One piece of flannel, 24x36 inches.
One roll of absorbent cotton (1.5 ounces).
One 3-in. by 10-yd. roll of gauze bandage.
One 2-in. by 10-yd. roll of gauze bandage.
One 1-in. by 5-yd. spool of adhesive plaster.

a low piston speed; its life and durability are correspondingly increased.

When drilling, the operator stands in front of the drill next to the drive pipe and has four levers in reach to control all actions of the machine. When in operation, the machine stands on a broad base, and when ready to move, the two-wheel axle is put in place. The pivoting point is such that two men tip the frame to a horizontal position. It is easily replaced in an upright position and made ready for drilling. The wheels and axle are then detached and removed. For soft ground the wheels are provided with extra-wide tires.



TYPE B MACHINE MAKING READY FOR DRILLING

The drill may also be equipped with a centrifugal pump for shaft sinking under special conditions. For this work the drill line-drum is used for hoisting.

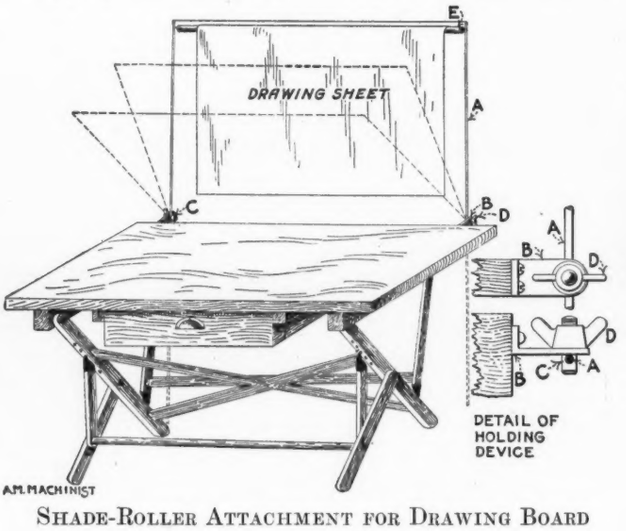
Stoping at Park City

Writing in the February "Bulletin of the American Institute of Mining Engineers," James Humes describes Park City mining methods (presumably those at the Silver King Coalition especially) as follows:

Most frequently the ore dips down from the fissures (that is, the north-dipping fissures); and if our drift in the fissure has cut the ore we work down on it as far as we can by shoveling the rock out. If it persists in going down, we rig up one of our many small hoists, of which we have over a dozen, ranging in size from a Holman stretcher-bar to a double-cylinder 35-hp. These little hoists enable us to raise our regular mine cars. If the angle is too steep for a direct pull, we simply fasten the end of the hoisting rope to a post at the top of the inclined winze, and pass it through a 7-in. pulley hooked into the car. This method gives the engine a double purchase; and even with our little double-cylinder 5x6-in. engines we are seldom unable to manage our 18-cu.ft. cars. If the deposit is too thin, we take up enough of the bottom to admit the car. Often our temporary inclines will meet with a face of barren rock. In such cases we do not cut through the waste but turn our rails to the right or left, as the case may be, and follow the ore. Should the ore continue down on the dip for a considerable distance, we run small drifts right and left from our main incline, in which we use a small special car, dumping its contents into a hopper that connects with the car on the main incline. Should there be a sufficient thickness of ore at the point where we wish to run one of these sublevels, we simply put down a track switch on the main incline, the points of which we throw with a lever on the level that is connected with the points by means of a long rod, crank and short rod, and in this way we are able to load the mine cars that are hauled to the ore bins on the surface.

Copyholder for Draftsman

Writing in the *American Machinist,* John E. Cahill describes his invention intended to aid the draftsman in copying and combining drawing and maps. The de-



SHADE-ROLLER ATTACHMENT FOR DRAWING BOARD

vice is made for attachment to a drawing-board. It consists of the rods *A,* fastened to the table with the angle irons *B.* A socket *C* holds the rods in any desired position, being locked with the thumb-screws *D.* A shade roller *E* is fastened to the two vertical rods, a wire being attached to hold the upper ends of the rods rigid. The attachment may be placed in any desired position or dropped behind the table should it not be in use. When the draftsman is working on the drawing board, drawings for reference are placed on the roller, thus locating the drawing in a convenient position for use. The device would seem to hold out promise of usefulness to the mining engineer required to combine data from a number of old maps into a new map, and for similar work.

Details of Milling and Smelting

Size of Products from Square and Round Hole Screens

By H. A. Roesler*

In practice, screens larger than 1 mm. usually consist of round perforations in plates. In laboratory work the hand screens are made of wire cloth, the openings of course being square. It often becomes necessary to know what size of square opening is equivalent to a specific size of round opening or *vice versa*. The following tests were made to show this relation, a set of hand screens with round perforations being checked against a set of accurately measured wire-cloth screens.

A sample was first screened through the perforated plates and the cumulative curve plotted as shown in Fig. 1. It was then screened through the wire-cloth screens

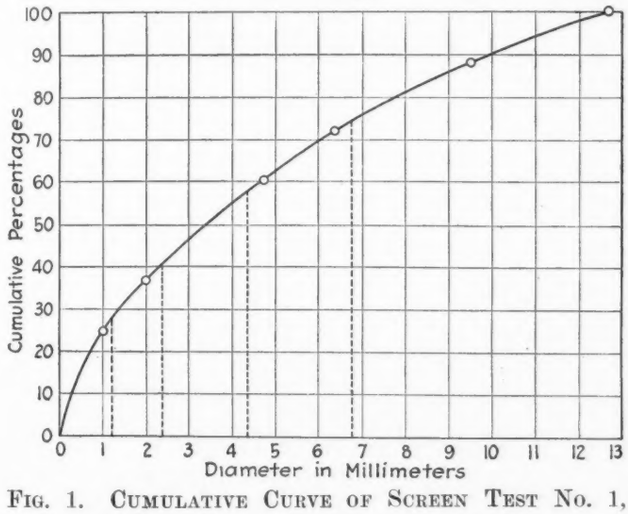


Fig. 1. Cumulative Curve of Screen Test No. 1, Using Round-Hole Screens. Dotted Vertical Lines Show Points Where Wire-Cloth Percentages Cut the Curve

and, from the cumulative curve, the size with round holes, equivalent to the percentage obtained with the wire cloth, noted. The ratio between the space of the wire-cloth screen and this size is the relation sought.

SAMPLE SIZED THROUGH ROUND- AND SQUARE-HOLE SCREENS

Size of Round Holes	Percentage of Sizes Test No. 1	Test No. 2	Test No. 3	Test No. 4
On 9.53 mm	11.9	0.7	9.5	1.5
9.53 mm. to 6.35 mm	15.9	1.1	15.8	2.9
6.35 mm. to 4.76 mm	11.8	1.8	10.8	3.0
4.76 mm. to 2.00 mm	23.0	42.4	19.6	31.4
2.00 mm. to 1.00 mm	12.2	27.9	12.0	29.8
Through 1.00 mm	25.2	26.1	32.3	31.4

Space of Wire Cloth	Percentage of Sizes Test No. 1	Test No. 2	Test No. 3	Test No. 4
On 5.41 mm	25.1	1.5	23.1	4.5
5.41 mm. to 3.48 mm	17.7	3.6	16.3	4.5
3.48 mm. to 1.88 mm	16.6	33.7	14.4	26.8
1.88 mm. to 0.91 mm	12.9	29.7	13.1	28.4
Through 0.91 mm	27.7	31.5	33.1	35.8

EQUIVALENTS OF ROUND AND SQUARE HOLES

Space of Wire Cloth	Equivalent Size of Round Holes Test No. 1	Test No. 2	Test No. 3	Test No. 4
5.41 mm	6.78 mm.	6.80 mm.	6.68 mm.	6.35 mm.
3.48 mm	4.34 mm.	4.29 mm.	4.36 mm.	4.42 mm.
1.88 mm	2.34 mm.	2.33 mm.	2.26 mm.	2.18 mm.
0.91 mm	1.17 mm.	1.18 mm.	1.05 mm.	1.15 mm.

*Mill superintendent, Vinegar Hill Zinc Co., Platteville, Wis.

Space of Wire Cloth	Ratio of Space of Wire Cloth to Equivalent Size Round Hole Test No. 1	Test No. 2	Test No. 3	Test No. 4	Average for Each Screen
5.41 mm	1.25	1.26	1.24	1.17	1.23
3.48 mm	1.25	1.23	1.25	1.27	1.25
1.88 mm	1.25	1.24	1.20	1.16	1.21
0.91 mm	1.29	1.30	1.15	1.26	1.25
Average each test	1.26	1.26	1.21	1.21	1.23

DESCRIPTION OF SAMPLES

Test No. 1. Limestone crushed through ½ in.
Test No. 2. Zinc concentrates from jigs, through ½ in.
Test No. 3. Limestone crushed through ½ in.
Test No. 4. Zinc concentrate from jigs, through ½ in.

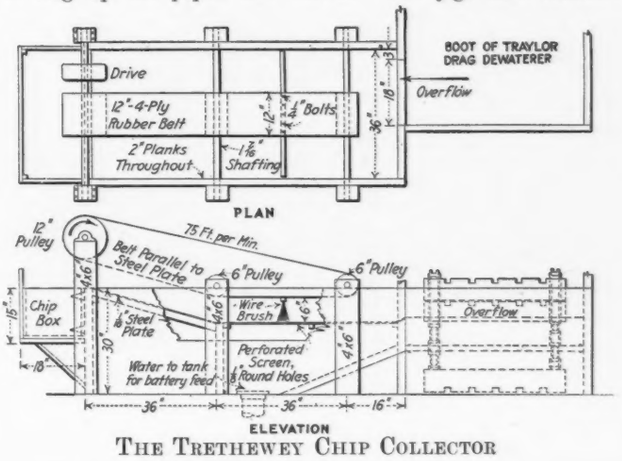
The average of all tests on all screens shows the ratio of space of wire cloth to equivalent size of round hole to be 1:1.23. In other words, if one screens material through wire cloth having a space of 1 mm., it is equivalent to screening it through round perforations of 1.23 mm. diameter.

It should be noted that this factor is very nearly the average of the diagonal of a square opening and its side. The ratio shown here may not be constant for all minerals, due to their difference in shape when crushed.

Trethewey Chip Collector

By G. H. Moyer*

The accompanying drawing shows a device in use at the Trethewey mill for collecting chips and rubbish which get into the mill water and, unless removed, tend to clog up the pipes and valves. The jigs and concentrators discharge into a Traylor drag dewaterer, the overflow from which, after having the chips removed, is sent to a storage tank to be used in the batteries.



The Trethewey Chip Collector

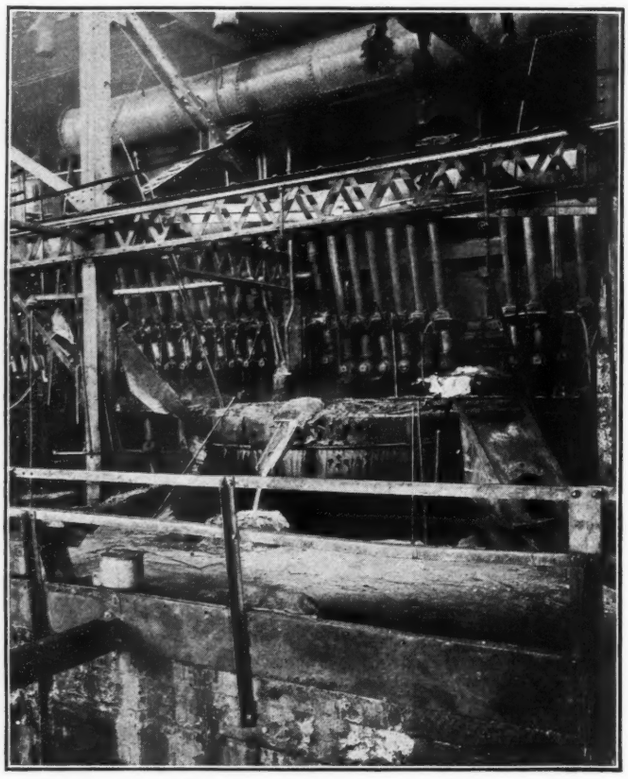
The accompanying sketch of the collector is self-explanatory and shows the different parts in detail. Attention is called to the small perforations in the screen, by the use of which practically all the chips and wood pulp are removed. This enables the operator to use the jig water over again without fear of blocked valves, etc. The device has now been in operation for nine months and has

*Mill superintendent, Trethewey Silver-Cobalt Mine, Ltd., Cobalt, Ont.

proved entirely satisfactory. The screen has not choked up since its installation. Furthermore, it needs practically no attention.

Tapping Shield at Anaconda

The accompanying engraving shows a part of one of the Mathewson blast furnaces at Anaconda, Mont. There has always been so much to say about these big furnaces, when writing about the Washoe works, that some of the interesting details have been passed with scarcely any mention. The shields to protect tappers when stopping the matte are shown at the two tapholes of the settler. One of the shields is shown in position, ready for tapping; the other shield is in the elevated position in which it is ordinarily suspended when it is desired to work at the taphole. The shield is hinged at the top to brackets on the settler, and at the bottom a guy wire, connecting with



TAPPING FLOOR AT ANACONDA, MONT.

Since the above photograph was taken, a vertical steel plate has been erected on the side of the settlers opposite the spout, thereby protecting those who may be passing or standing in the runway from spout explosions.

a counterweight through small overhead pulleys, makes it easy to lower or raise the shield. When lowered in position for stopping the taphole, the tapper may rest the dolly bar on the angle iron at the bottom of the shield opening. The plate constituting the front of the shield is at some distance from the settler at the top so as to permit the escape of fumes. The great advantage of the shield attached to the settler is that it is always at hand when the taphole is to be stopped and hence there is no hasty scurrying around to find a loose shield at the last minute; this happens at some plants and as the matte ladle begins to overflow, the tapper becomes nervous and perhaps "misses the hole," with a resultant spill of matte entailing additional labor in cleaning up. The attached shield reduces the chances of the tapper failing to stop the hole and, also, the liability of his getting burned. At some other works the advantages of an attached shield is also appreciated, and some tappers prefer a nearly vertical shield to the shield shown, which has been in use at Anaconda for 10 or more years.

Another feature of the furnace practice at Anaconda is the use of a clay insulating shield; this is plainly shown in the accompanying engraving over the settler slag spout. It is used instead of coke or wood for the purpose of preventing the slag from chilling and stopping the flow. The clay shield is also applied to the furnace spout and under favorable conditions works satisfactorily, though at times a little coke or wood is required to assure free running. At other smelting works not using the easily chilled high-lime slag made at Anaconda, it has been found feasible to use the clay shield for long periods with no fuel whatever.

Improved Lead Recovery at Herculaneum, Mo.

As the result of the campaign of reconstruction which the St. Joseph Lead Co. has had in progress for several years at Herculaneum, Mo., the lead recovery at that plant has shown a steady and consistent improvement until now it is reported to be over 96%—a gain of more than 5% over the conditions which existed four years ago. According to the annual report of the company, 1% of lead recovered is worth about $4800 per month when lead is at 3.75c. per lb. The importance of this improved recovery is therefore apparent. The better recovery has been obtained by improved work in every department of the plant, but it has been divided roughly as follows: Roasting, 1½%; furnace tops, 1½%; slag loss, ½%; flue, ¼%; baghouse, 1½%. In the increased efficiency resulting from the campaign of reconstruction the plant shows its most important gain in the increased recovery.

Rules for Thickness and Weight of Lead Pipes

The thickness of lead pipe required to withstand a given pressure may be calculated by the following formula (*Power*, Mar. 9, 1915):

$$T = \frac{0.433 \times H \times R}{2745}$$

in which

T = Thickness of pipe in fractions of an inch;
H = Head of pressure in feet;
R = Radius of pipe in inches;

from which we get

$$T = 0.0001578 \times H \times R$$

For lead a factor of safety of 10 is required, hence the last rule becomes $T = 0.001578 \times H \times R$

or, if we take D = the diameter of pipe in inches, instead of radius R, we get

$$T = 0.000789 \times H + R$$

The formula for the weight of lead pipes is

$W = 3.86\ (D^2 - d^2)$; or $3.86\ (D + d) \times (D - d)$

in which

W = Weight of pipe per lineal foot in pounds;
D = External diameter of pipe in inches;
d = Internal diameter of pipe in inches;
3.86 = A constant.

The Cost of Doing Things

Development Costs Per Foot

Average development costs at the Montgomery mine at Candor, N. C., for a period of six months are shown in the accompanying table. The drifts were the usual 4 ft. 6 in. by 6 ft. 6 in., and the shaft was 8x11 ft. outside the timbers. The country rock was a hard, tight diabase, sometimes slaty, and with frequent joint planes which gave the gases a chance to run off into the country and spoil the break. Air drills were used.

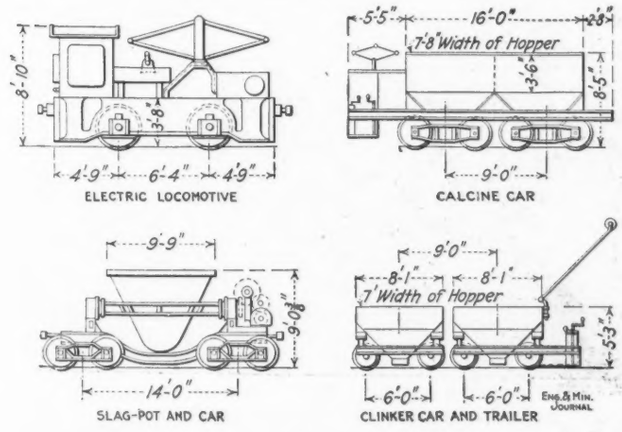
UWARRA MINING COMPANY. MINING COSTS, SIX MONTHS—1912

	Underground Costs per Foot									
	Labor					Supplies				
	Breaking	Mucking	Hoisting Compressed Air Pumping	Powder	Caps	Fuse	Candles	Timber	Fuel Estimated	Total
150 lev. Mont. So. Drift	$2.07	$0.30	$0.40	$0.334	$0.023	$0.045	$0.043	.....	$1.40	$4.62
Mont. No. Drift	1.296	0.865	1.754	0.615	0.043	0.104	0.06	.....	1.40	6.14
Mont. Rise-2	0.979	0.347	0.480	0.204	0.015	0.038	0.026	0.24	1.20	3.53
225 lev. Mont. No. Drift	1.35	0.804	1.828	0.65	0.036	0.093	0.061	....	1.90	6.72
Mont. Rise-2	3.364	0.897	1.29	0.913	0.04	0.117	0.098	0.24	1.40	8.36
Mont. Rise-3	2.237	0.705	0.788	0.52	0.037	0.092	0.057	0.24	1.40	6.08
Mont. Rise-4	2.513	1.11	0.957	0.698	0.047	0.117	0.070	....	1.20	6.71
Mont. S. Rise-1	2.00	0.27	0.22	0.48	0.03	0.07	0.04	....	1.40	4.51
Iola-No. X-Cut	2.56	1.28	0.91	0.632	0.034	0.093	0.073	....	1.90	7.48
Iola-So. Rise-1	2.405	0.65	1.20	0.63	0.054	0.095	0.071	0.24	1.40	6.75
Iola. So. 150'-Subs	1.394	0.329	0.947	0.31	0.024	0.057	0.043	0.24	1.25	4.59
300 lev. Main, East X-cut	2.456	0.78	1.35	1.174	0.129	0.082	0.068	....	2.40	8.44
Iola So. Drift	2.22	0.60	0.968	0.782	0.039	0.111	0.052	....	2.40	7.17
Main-West-X-cut	2.70	0.96	1.513	1.54	0.187	0.081	0.078	....	2.40	9.47
Mont. No. Drift	3.03	0.583	1.317	1.24	0.062	0.163	0.073	....	2.40	8.85
Mont. So. Drift	3.16	0.71	1.25	1.198	0.061	0.159	0.078	....	2.40	9.02
Main Shaft, No. 2	14.46	9.23	2.75	2.76	0.37	0.130	0.38	2.47	4.75	37.30

Powder cost $15 per 100 lb., fuse $6 to $7.50 per 1000 ft., caps 80c. per 100, candles $3.25 per case. Labor cost for muckers $1.50, chuckers $1.50, machine runners $1.75 for 10-hr. shifts except in the shaft where chuckers got $1.75 and runners $2 for eight-hour shifts. Labor was largely negroes—unskilled and irregular.

Cost of Cars, Electric Locomotives, etc., for Arizona Copper Co.'s New Smeltery

The cost of cars, electric locomotives, etc., for the new smeltery of the Arizona Copper Co., Clifton, Ariz., according to *Bull.* 91, A. I. M. E., "Unit Construction Costs from the New Smelter of the Arizona Copper Co.," by E. Horton Jones, was $35,204.30. Of this amount, $385.38 ($381.02 for labor) was for alterations to calcine cars. These cars, with their pantographs on top, were too high to operate successfully beneath the roasters. To overcome this difficulty, the tracks beneath were lowered 1 ft. and the cab end of the car was cut down 18 in. in height. The pantograph was then placed on the cab end of the car. Much difficulty was also experienced with the pantographs themselves, especially when the cars were on short curves and taking switches. This cost covers all the labor and material incident to overcoming these difficulties. The table covers the cost of equipment, together with labor for unloading, trying out, removing air brakes from the slag cars which came in on their own wheels, installing extra controllers on slag cars, and a large amount of repair work in addition to alterations to calcine cars. The accompanying diagrams are sketches of the electric locomotive, calcine car, slag pot and car, and clinker car and trailer. Illustrations of these cars on the tracks at Clifton are shown on p. 923, of the JOURNAL for Nov. 21, 1914.

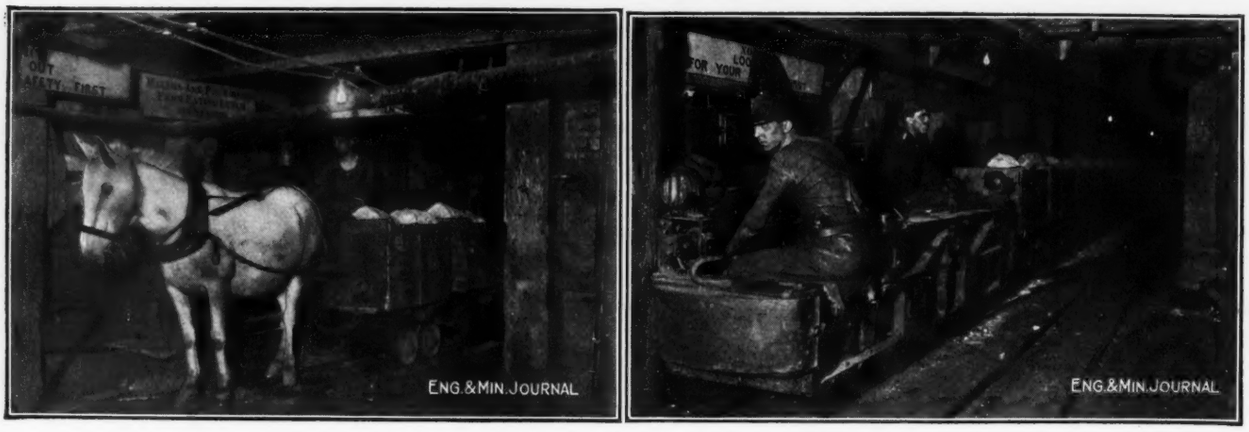


TYPES OF CARS, A. C. CO.'S SMELTERY

COSTS, A. C. CO.'S SMELTERY CARS AND LOCOMOTIVES

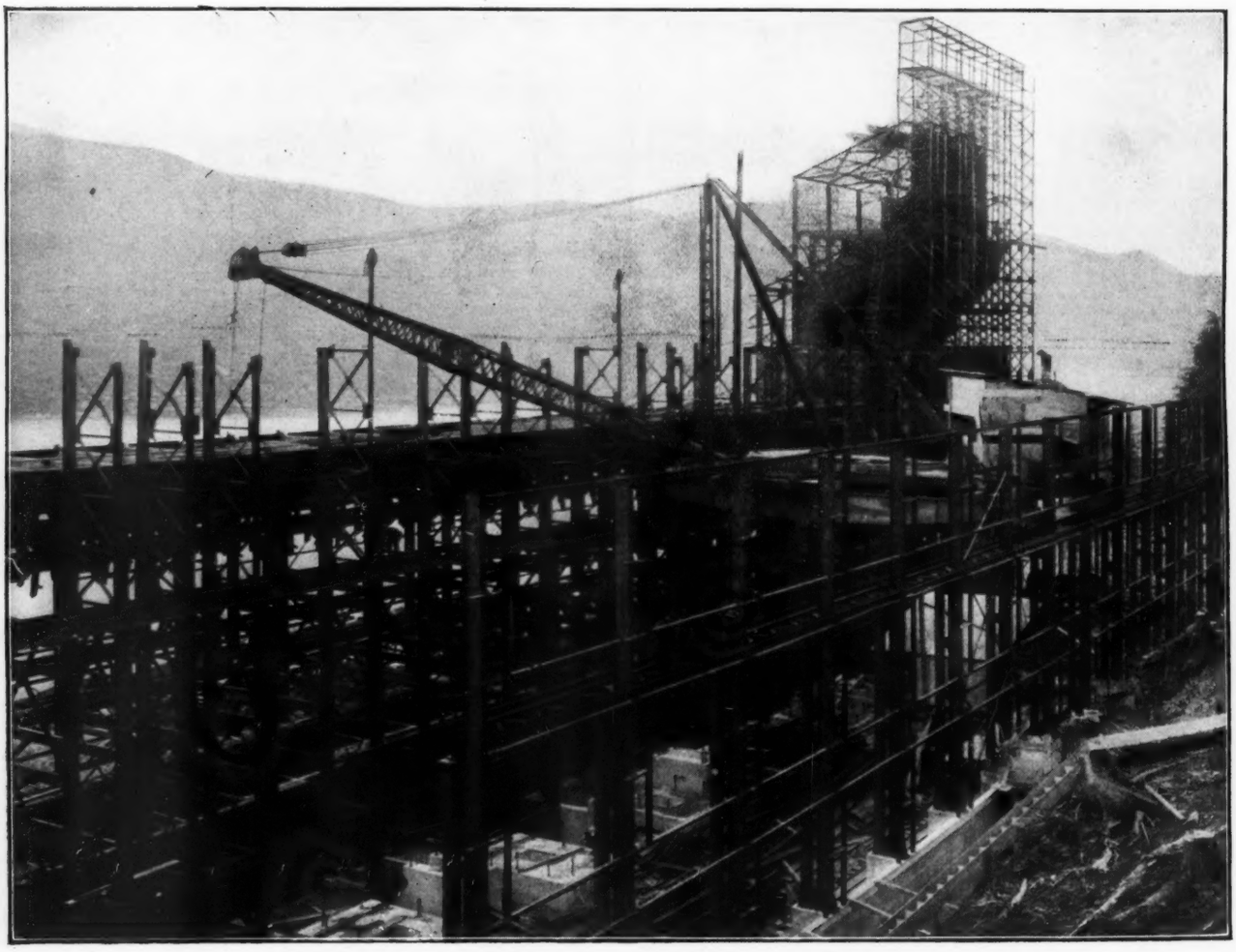
	Factory Cost	Freight	Total
Three 18-ton calcine cars, weight of each, including electrical equipment, 33,200 lb. from Kilbourne & Jacobs Mfg. Co.	$7,200	$1,394.22	$8,594.22
Four 225-cu.ft. capacity electrically operated slag cars, from M. H. Treadwell Co. Cars are side-dumped by 15-hp. motors; can also be dumped by hand. Weight of one car, 57,000 lb.	11,620	513.48	12,133.48
Two 18-ton electric locomotives from Westinghouse Mfg. Co. Drawbar pull, 8000 lb. Each locomotive has two 84-hp. motors Weight of each locomotive is 43,950 lb.	8,500	1,380.03	9,880.03
One clinker larry car, 12½ tons capacity, 10-hp. motor, weight 11,000 lb.	1,450	176.00	1,626.00
Two trailer cars, 165 cu.ft. or 25,000 lb. capacity, weight of each car 5000 lb.	680	160.00	840.00
Two 15-hp., 220-volt drum type controllers for electric locomotives to dump slag cars	....	.....	165.64
One pair Schoen rolled-steel wheels with axles for slag cars	....	.....	115.66
Miscellaneous material	....	.....	662.60
Total cost			$34,017.63
Labor cost			801.29
Alterations to calcine cars			385.38
Total cost of cars, locomotives, etc.			$35,204.30

Photographs from the Field



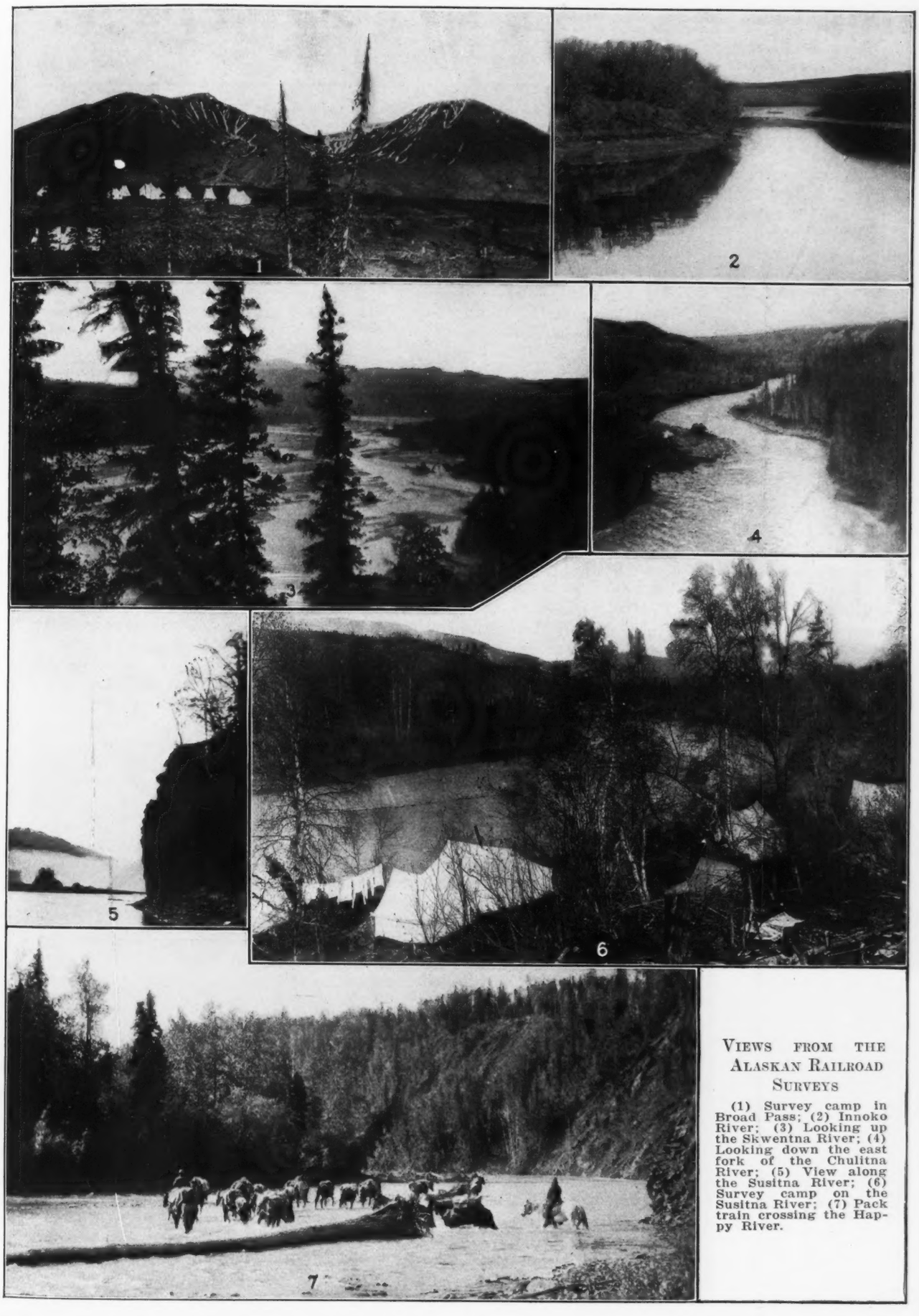
UNDERGROUND TRANSPORTATION AT BUTTE

The old system uses horses or mules. Modern electric locomotives are also installed.



ALASKA-GASTINEAU MINING CO.'S MILL, THANE, ALASKA

Erecting the steelwork of the 6000-ton mill unit, a portion of which is now in operation. Crushers and rolls prepare the ore for concentration



VIEWS FROM THE ALASKAN RAILROAD SURVEYS

(1) Survey camp in Broad Pass; (2) Innoko River; (3) Looking up the Skwentna River; (4) Looking down the east fork of the Chulitna River; (5) View along the Susitna River; (6) Survey camp on the Susitna River; (7) Pack train crossing the Happy River.

The Master Crook

By Berton Braley

Jim Bowker is in jail this day
An' like to stay awhile,
Fer gettin' in a cuttin' fray
An' slashin' round in style,
Who was it made Jim draw that knife
An' laughed his sense to scorn,
So he forgot his kids an' wife?
Go ask John Barleycorn.

Bill Welsh fell down a chute last night
An' he won't work no more,
He's lyin' home all still an' white
That was so live, before.
What made his eyes so blear an' dim,
Why was it that he fell
Leavin' his folks to mourn for him?
John Barleycorn kin tell.

Red Smith he makes a heap of dough
Contrackin' in a raise,
An' yet his wife an' kiddies go
Half-ragged all their days,
Their cabin's ugly, rough an' bare
They're thin an' pale, forlorn,
Why ain't they got enough to wear?
Go ask John Barleycorn.

John Barleycorn—he seems your friend,
A pleasant pal to meet,
An' at the first the hours you spend
With him are mighty sweet,
But give him time an' he will make
The strongest man his slave,
His winnin' ways are all a fake,
John Barleycorn's a knave.

The wise boys never fool with John,
For long ago they've found,
He kills more men than miner's con
Or dangers underground;
They've seen the woe an' horror borne
Upon his poisoned breath,
An' so they shun John Barleycorn,
Whose other name is Death.

Written expressly for "The Engineering and Mining Journal."

Canadian Mining Institute Meeting

SPECIAL CORRESPONDENCE

SYNOPSIS—A successful meeting, although the war made some inroads on attendance.

The Seventeenth Annual Convention of the Canadian Mining Institute was held at the King Edward Hotel, Toronto, Mar. 3 to 5, and despite a smaller attendance than usual, especially from the outlying districts, proved highly successful. The papers read excited more than ordinary interest and resulted in several animated and well-maintained discussions. In the absence of President G. G. S. Lindsey, at present in England, the chair was taken by Vice-President A. A. Cole, of Cobalt.

Hon. G. Howard Ferguson, Ontario Minister of Mines, in welcoming the convention on behalf of the Provincial government, in allusion to his recent appointment said he hoped to demonstrate at a later period that he was a good student of the branch of industry with which he had become identified. In view of the burdens entailed by the war it was incumbent upon them to see that production was well maintained, and mining men should realize their responsibility in this respect. A. J. Young extended a hearty welcome on behalf of the Toronto branch.

Mr. Cole in the course of a brief address spoke of the disturbance in conditions caused by the war, which had resulted in a diminished attendance. As nearly as could be ascertained about 10% of the members had enlisted and some of them were now on the fighting line.

The first business taken up was the consideration of the proposed amendments to the by-laws governing the election of councillors. Hitherto the 20 councillors have been chosen by the members at large, half of the number retiring each year. It was contended that under this system Ontario and Quebec furnished nearly all of the councillors while the remaining provinces had few representatives. The amendment, which was introduced by Clifford E. Smith and seconded by A. G. Burrows, provided that the election should be by provinces, each province having a representation in proportion to its membership, and that for this purpose British Columbia should include the Yukon; Alberta, Saskatchewan and Manitoba should be grouped as one province; the Maritime Provinces also forming a unit. The proposition was warmly debated, the principal opposition coming from the Cobalt Branch on the ground that as the present was an abnormal year on account of the absence of such a large proportion of the membership, the consideration of the question should be postponed until next year. A resolution to that effect was moved by A. A. Cole, seconded by Norman Fisher. As showing the necessity for a change it was stated by Prof. H. E. T. Haultain, of Toronto, that out of 50 men chosen to the Council during the last five years, only eight represented provinces outside of Ontario and Quebec. The discussion was enlivened by the interchange of sharp but good-humored personalities between Professor Haultain and Mr. Cole, which created much amusement. The resolution to postpone consideration was lost and the amendments carried by a vote of 48 to 21.

John McLeish, chief of the Division of Mineral Resources and Statistics, presented a preliminary report of the mineral production of Canada during 1914.

T. W. Gibson, Deputy Minister of Mines for Ontario, in presenting the report of the mineral production of the province for 1914 stated that the principal decreases were in silver, nickel and pig iron. In his opinion the maximum production of Cobalt had been reached and it might be expected to show a gradual diminution of production. A falling off in the output of nickel and pig iron was due to the war, and the lessened activity in the building trade had curtailed the production of structural materials. On the other hand the development of the Porcupine mines had resulted in a substantial increase in the output of gold.

Theo. C. Denis, Superintendent of Mines for Quebec, presented the preliminary statement of mineral production in that province for 1914 showing a decrease. He said that the main decrease was in asbestos, for which Germany had been an important customer, but shipments to the United States were now increasing and the demand for magnetite was also likely to be augmented.

D. B. Dowling, Ottawa, read a paper on the structural geology of the Alberta oil fields. He said that six or seven companies were boring on the Turner Valley anticline. In addition to the original find and No. 2 well, several of these had showings of oil, but the operations in the broken country of the foothills had not been successful and the prospect of finding oil in that direction was not favorable. On one of the wider anticlines northwest of the original discovery some oil had been found, and also some on the Milk River.

Professor Haultain read a paper on "The Stimulation of Prospecting," pointing out that the decline in production must continue unless new discoveries were made, for which it was necessary to train and encourage prospectors. The old-time prospector has gone and must be replaced. There are many young men who are fitted for the work, but they should be encouraged and properly trained for it. Invention has been organized instead of being left, as formerly, to individual initiative, and prospecting ought similarly to be organized by the government and the corporations. A long and interesting discussion followed during which various suggestions as to how prospecting should be encouraged were advanced. G. R. Rogers, of Gowganda, and W. M. Goodwin, of Kingston, advocated the subsidizing of prospectors by the government, the latter stating that in Australia smelting plants had been established in mineral districts, so that prospectors' ore could be tested practically free of expense. T. W. Gibson said he had looked into the matter but had been unable to ascertain that any new or important fields had been brought to light in Australia by state-aided prospecting.

Professor Guess, Toronto, thought valuable data on the subject could be obtained from the state of Colorado. J. J. Harpel, Montreal, advocated the addition of books on primary mining to the school libraries. Arthur B. Clabon, Vancouver, said that the coöperation of business men in an effort to stimulate prospecting should be obtained, as the mining industry was worth so much to commercial interests.

Several speakers urged that prospectors should be regarded as partners and given a percentage on the value of their discoveries. It was decided to appoint a com-

mittee to consider the question and report a definite plan of action to be adopted by the Institute.

In the evening E. T. Corkill, of Copper Cliff, Ont., read a paper on "Safety Engineering at the Canadian Copper Co.'s Works and Mines," illustrated by moving pictures showing safety work at the plant of the New Jersey Zinc Company.

D. H. Browne, of New York, gave a suggestive paper on "Things We Might Have Done," showing the benefits frequently gained by the lessons learned through failures.

A resolution offered on Thursday by Dr. F. D. Adams, Montreal, and seconded by T. W. Gibson voicing the thanks of the Institute to the members who have enlisted was adopted.

Dr. F. D. Adams dealt with the "Conservation of Mineral Resources." He said that while there was but little waste in metallic mining there was a great deal in the extraction of coal. Until recently in Nova Scotia there was as much coal wasted as there was taken out, but this waste has now ceased under a strict system of government inspection. In the new coal areas in the West, however, wasteful processes are still maintained, as the lessees are allowed to operate as they please. By the substitution of gas producers for steam engines a great amount of energy could be saved. Another important saving could be accomplished by the adoption of byproduct coke ovens in place of the bee-hive ovens, which allowed the tar, sulphate of ammonia and other valuable constituents of the coal to go to waste.

Charles Fergie, Sydney, N. S., pointed out that in estimating the coal reserves large allowances must be made for deposits in inaccessible regions and seams which cannot be economically worked. The government should appoint an official to see that all mines are carefully laid out and systematically worked. James McEvoy, Toronto, said conservation should be judiciously applied, otherwise important industries might be injured, as had been the case with the Alaska coal-mining industry. Working a mine in accordance with a plan drawn up in advance might do in Nova Scotia, but was not suited to the Western coal areas, which were characterized by continual changes of dip.

Walter A. Schmidt, Los Angeles, Calif., gave a most interesting paper on the Cottrell process for controlling fumes and extracting the metallic and chemical values of smoke and dust, copiously illustrated by lantern slides and moving pictures showing the plants where the process had been introduced. This was followed by a practical demonstration with a model apparatus conveying a clear idea of the working of the system.

"The Smelting of Titaniferous Ores in the Blast Furnace" was dealt with by Bradley Stoughton, of New York, who sought to show that the prejudice existing against these ores was unfounded. Experience had shown than ores containing from 5 to 20% of titanium oxide could be successfully smelted. Ore has been used in England containing as high as 36% of titanium oxide. Canada had large deposits of titaniferous ore and if it were treated mixed with other ores in as large a proportion as could be done without interfering with smelting it would greatly increase the available ore reserves of the country. F. A. Jordan, of Sellwood, Ont., and other speakers, thought it would be a matter of difficulty to prevail upon blast-furnace operators to use titaniferous ores.

E. B. Thornhill, Cobalt, read a paper on the "Recovery of Mercury from Residues of Amalgamated Cobalt Ores" describing the process used for that purpose by the Buffalo Mining Co., by which the mercury was recovered in a pure condition and free from arsenic.

The annual dinner was held in the evening, the speakers at which included Hon. G. Howard Ferguson, Major Tolmie, M. P. P., Bradley Stoughton, of New York, Col. Hay, Haileybury, Ont.; D. H. Browne, New York, and Dr. Thompson, M. P., of the Yukon.

On Friday officers for the ensuing year were elected as follows: President, G. G. S. Lindsey (by acclamation); vice-presidents, Thomas Cantley, Sydney, N. S., and A. A. Cole, Cobalt, Ont.

Councillors: Prof. M. B. Baker, Kingston, Ont.; Prof. J. W. Bell, Montreal; Prof. R. W. Brock, Vancouver; Theo. C. Denis, Quebec; D. A. Dunlop, Toronto; M. B. R. Gordon, Cobalt; G. C. Mackenzie, Ottawa; D. H. McDougall, Sydney, N. S.; J. T. Stirling, Edmonton, Alta.; A. J. Young, Toronto.

O. B. Perry, New York, dealt with "Recent Developments in the Gold-Dredging Industry of the Yukon." J. A. Van Mater, New York, presented a paper on "The Zinc Industry in America." In answer to a question as to the reason for the high price of zinc dust, which is a byproduct from the manufacture of spelter, he explained that it paid the manufacturers better to return it to the retort than to market it in the form of zinc dust. Belgium produced zinc dust as a special product, not as a byproduct. "The Origin of the Wabana Iron Ore" was the subject of a paper by Albert O. Hayes, Ottawa. J. B. Tyrrell, Toronto, gave a paper on "Gold on the North Saskatchewan River." He estimated that during the past half century this region has yielded gold to the value of half a million dollars. The gold-producing area extends from the Rocky Mountain House to Prince Albert, a distance of 650 miles, the gold being found associated with coarse gravel. Attempts to find a paystreak on bedrock have proved failures and geological conditions are not favorable to its existence. Associated with the gold is a small amount of platinum.

E. L. Bruce, of Ottawa, described "A New Gold Area in Northern Saskatchewan and Manitoba," in which valuable finds were made in 1913. This region stretching from Beaver Lake, Sask., into Manitoba for 100 miles east and west has a width of about 30 miles, and the rocks are similar to those of northern Ontario. He regarded it as a favorable field for the prospector.

The meeting then adjourned until next year.

Chronology of Mining for February, 1915

Feb. 1—Bristol mine, Crystal Falls, Mich., resumed operations.

Feb. 6—Serious cave in inclined shaft, Gagnon mine, Butte, resulted in death of four men and slight injuries to two.—Calumet & Hecla and its subsidiaries resumed work on full-time basis.

Feb. 12—Calumet & Hecla announced resumption of dividends.—Harry Robinson, vice-president, new Mine Workers' Union, and an I. W. W. agitator, shot and killed Anaconda guard.

Feb. 15—Annual meeting of American Institute of Mining Engineers in New York.

Feb. 18—First 1500-ton unit of Alaska-Gastineau mill at Juneau started.

Feb. 20—Man killed while unloading timber at Wilcox mine, Cuyuna Range.

Feb. 23—Five miners arrested for high-grading in the Cripple Creek district, this being the beginning of a new crusade against this practice.

Feb. 24—Two men injured by fall of rock at Armour No. 2 mine, Cuyuna Range.

Feb. 26—One man killed by cave-in at Kennedy mine, Cuyuna Range.

Work of the Sixty-Third Congress

Secretary Lane, of the Interior Department, in an interview on Mar. 5, expressed himself as pleased with the record made by the Sixty-Third Congress on legislation affecting the work of the Interior Department and the public affairs under its administration.

"No single Congress in a decade," said the Secretary, "has passed and considered so much constructive legislation for the development of the West, the encouragement of pioneers and settlers, and the economical administration of the many interests handled by this department.

"Probably the biggest item in the list is the legislation for the building of the Alaskan railway, for which $2,500,000 is now available, and the opening and leasing of Alaskan coal lands.

"The temporary oil-leasing bill for the relief of the oil situation, the authorization of establishment of 10 mine-experiment bureaus and 15 additional mine-rescue stations, the appropriations for extension of the work of the Bureau of Education in rural and industrial sections, are all progressive measures. In its every act in relation to the public domain and the work of this Department, the Congress just adjourned has evinced a desire to further the interests and encourage the efforts of the man or woman anxious to aid in the country's development, and has frowned upon the speculative and exploiting class.

"Real progress has been made toward true conservation of our natural resources. Although the leasing bills for opening up the coal, oil, phosphate and potash lands and water-power sites to development failed in the Senate because of obstructionistic tactics, the favorable action by the House upon these measures and the passage of the law opening the surface of phosphate and potash lands to homesteading, and providing that the mineral deposits in these lands shall remain withdrawn until further action by Congress, is highly significant of the purpose of Congress to complete this program at an early date."

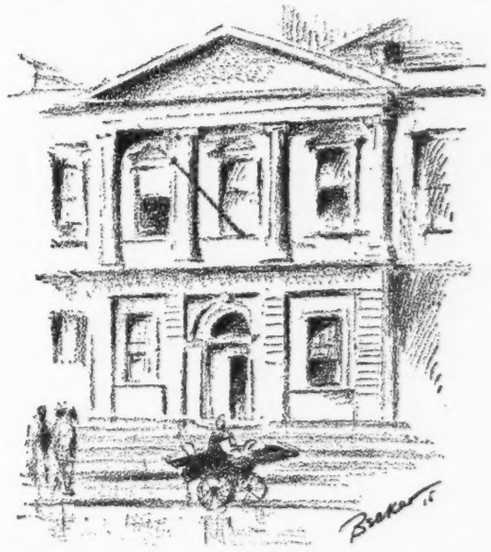
Among other measures of importance relating to the public domain and the affairs of the Interior Department which have been enacted by the Sixty-Third Congress, Secretary Lane mentioned the following: Authorization of a new building for the Interior Department, estimated to cost $2,500,000, of which $1,500,000 is appropriated this year. This new building, to be erected at F and Eighteenth streets, Washington, will contain quarters for all the bureaus of the Department except the Patent Office, the Bureau of Education and the Pension Bureau. An appropriation of $500,000 for the construction of new laboratories for the Bureau of Mines at Pittsburgh. The appropriation of $35,000 to permit Dr. Rittman to continue his research and experimental work with petroleum and natural gas. The creation of a Board of Review in land cases, in the office of the Secretary of the Interior. The act authorizing the President to provide a method for opening lands restored from reservation of withdrawal. The validating of locations of deposits of phosphate rock heretofore made in good faith under the placer-mining laws.

The Old U. S. Assay Office

The U. S. Assay Office in Wall Street, New York, has a certain interest to the mining and metallurgical fraternity, since it is estimated that about $1,500,000,000 has been put in circulation from here. The old building has long been one of the landmarks of the city. It was erected in 1823, of gray sandstone, and, as can be seen from the accompanying illustration, is a fine specimen of Ionic architecture.

It was originally the home of the United States Bank in the Andrew Jackson régime, but when that institution was liquidated it was transferred to the Bank of the State of New York. In 1854 the building was sold to the United States government and has since been used as Assay Office.

According to the New York *Tribune*, its front rooms were abandoned in 1910, when the walls next to the Sub-



THE OLD U. S. ASSAY OFFICE, NEW YORK
(By courtesy of the New York "Tribune")

Treasury began to bulge, and it has been found impracticable to use the facade in the construction of the new $607,000 fireproof building to be put up. This will have the largest vaults in the country, costing $327,000.

Commenting further on this, the *Tribune* says:

Robert W. De Forest, president of the Metropolitan Museum of Art, is to be the new owner of the facade of the old Assay Office. The gift of this historic bit of architecture from the government to Mr. De Forest was announced Feb. 24 by Commander Alfred B. Fry, chief engineer of the Treasury Department in this city.

Although Mr. De Forest could not be seen—he is now in the West Indies—it is understood that the facade will be taken down and each stone numbered carefully. Then it is probable that it will form the front of a new building to be erected by the museum to house Americana. This plan will be carried out if sufficient funds are obtained. It is expected that a collection of Colonial furniture from Mrs. Russell Sage will form the nucleus of the exhibit.

Bids for the removal of the Assay Office will close on Mar. 16, and shortly after the wreckers will go to work. Within a few months the erection of a new building will be begun.

Correspondence and Discussion

Synthetic Crude Oil

I have read with interest the account of the work of Dr. Walter O. Snelling, in the JOURNAL of Feb. 20, 1915, in producing "synthetic crude oil" from various hydrocarbon mixtures. It is not only well known that distillation of heavy hydrocarbons under pressure causes a breaking up and rearrangement of their molecular structure, but also that it is the basis of many patents for making gasoline from heavy oil. The work of Snelling is comparable to Burton's process for producing gasoline from gas and fuel oils by distillation and condensation under pressures, whereby hydrocarbons consisting mainly of the paraffin series are produced as well as a small percentage of fixed gas.

As stated by Dr. Snelling the relation of the volume of oil to the capacity of the still has much to do with the characteristics of the products ultimately obtained. In short it may be safely said that crude petroleum distilled in the ordinary manner will yield larger percentages of gasoline as the volume of oil charged is cut down, which has been explained as due to a larger area of metallic contact surface, a point which has been taken advantage of in recent designs of pressure stills for manufacturing gasoline.

Although complete tests of the products worked with and obtained by Doctor Snelling are not given, the results as described are essentially those of the process well known to refiners as "cracking," and in what the innovation consists is not manifest.

THOMAS T. GRAY.

Elizabeth, N. J., Feb. 20, 1915.

Value of the Bawdwin Ore

In the JOURNAL of Jan. 23, 1915, p. 180, I find the ores of the Bawdwin mine in Burma valued on some basis that some of the readers do not understand. The statement is:

"Shipments of average-grade zinc-lead ore, without any attempt at hand-picking, namely, of a grade of 30% Zn, 26% Pb and 23 oz. Ag, showed a profit of from £2 to £2 10s. per ton of ore, when the combined metals had a value of £39, the average prices of the preceding four years."

What we do not understand is how the value of £39 is arrived at. Taking zinc at 6c., lead at 4½c. and silver at 60c. and the ton at 2240 lb., I make the value of the ore: Zn, $40.32; Pb, $26.21; Ag, $13.80, or a total of $80.32, or about £16 instead of £39. Perhaps you can explain this?

NEOOCH

San Francisco, Feb. 10, 1915.

[The expression "combined metals" with reference to the Bawdwin ores should have been more fully explained, as in the early reports of the Burma Corporation, Ltd. In making estimates of the value of the ores, it was necessary to assume a value of certain of its ingredients. The London prices of the four years, 1910-13, with certain deductions for the future course of the metals, were taken. Copper was taken at £63 10s. per ton, silver at 26d. per oz. and lead and zinc, combined, at £39 per ton. The expression "combined metals" refers only to the assumed market price of lead and zinc. The company report states that while "the prices of zinc and lead do not always fluctuate together, the metals occur in this ore in such proportion that for present purposes they may be considered as one."

We approve the principle adopted by the Bawdwin engineers, which is by no means original with them. To our own knowledge, the value of ore in the Joplin district of Missouri, which yields both galena and blende, has been computed in that way during many years. This is the best way in which to figure mixed ores, and often it is the only way. For example, how else would anybody figure the nickel-copper ore of Sudbury, Ont.?—EDITOR.]

The Location of the Iron Industry

It has sometimes been a matter of speculation and discussion that the accepted policy in the iron industry of the United States has been and is to haul the iron ore to the fuel rather than the fuel to the ore. The rule is generally received with little questioning and in locating new blast furnaces, it is the fuel supply rather than the ore supply which is the final deciding point. The one notable exception among recent plants was intended as compromise and there are some observers who have always considered that plant an economic mistake. It is only in a few districts, as in Alabama, where the close neighborhood of ore and fuel makes discussion over the selection of a furnace site unnecessary and precludes all considerations of transportation questions.

As in many such cases, the established practice is the outcome of early conditions and gradual growth, rather than of deliberation. In the beginning of the iron industry of this country in New Jersey and eastern Pennsylvania, local ore deposits determined the location of iron works. These were on a small scale and everywhere used charcoal, which could readily be supplied from the adjoining forests. Thus the hills of Morris and Sussex counties in New Jersey and the Lehigh and Schuylkill valleys in Pennsylvania were dotted with small forges and furnaces which used ore from neighboring mines and charcoal from neighboring kilns. The increasing cost of charcoal and the growing demand for iron brought about the use of mineral fuel, the use of larger furnaces and the gradual supersession of the old forges by the quicker and larger methods of the blast furnaces and the puddling furnaces. The ore supply was still largely from neighboring deposits, but the location was more generally fixed by the fuel supply. The furnaces of the Lehigh and Schuylkill valleys drew from the adjoining anthracite mines, New Jersey ores being hauled to them by canal. The ores of

central and western Pennsylvania and eastern Ohio were drawn to the Pittsburgh district, the Mahoning and Shenango valleys by the abundant coal of the Pittsburgh seam; and when the superiority of coke over raw coal as furnace fuel was established, the industry was further anchored by the discovery of the admirable coking coal of the Connellsville field. As the iron industry grew, its demands were met by the coke and anthracite furnaces, the chief charcoal iron districts remaining being the Berkshire district in eastern New York, Connecticut and Massachusetts, the Hanging Rock and Jackson County districts in Ohio and the Bellefonte-Tyrone district in central Pennsylvania. The South was not considered, for the South was then purely an agricultural region, and later when it began to be an iron-making country, it presented problems of an entirely different character.

So it happened that when the known Eastern ores gradually became scarce and more costly and the Lake Superior ores began to come in their place, the iron industry was already established around certain centers too firmly to be easily moved. The first Lake ores mined were carried to Pittsburgh and the Shenango Valley to be tested there. Later, when the extent and value of the Lake Superior deposits began to be realized, attention was given chiefly to improving the means of transporting them to the furnaces already built. From time to time plans were made for building furnaces in the Lake Superior country, but none of them so far has been successful. The only blast furnaces now active in the region are those at Marquette and St. Ignace and a few charcoal furnaces in the heavily wooded northern section of the lower Peninsula. The Steel Corporation, it is true, has begun to build a larger plant at Duluth; but it may be questioned whether it will really succeed any better than some other of its recent enterprises. It must be remembered also that the population of the Lake Superior country at that time was almost entirely a pioneer and mining population and moderate in number, so that the establishment of iron works there would have required the transfer of many skilled laborers for whom the country was not ready. Thus all the conditions at that time combined to keep the iron manufacture in the Central West, where it was already an established industry. Such improvements as were made from time to time were in the mining and more especially in transportation, gradually cutting down the cost of placing ore at the furnaces—a work which has been well performed.

Thus the conditions existing when our iron industry was comparatively small combined to give it a direction and policy which remained with its growth. That the general policy thus enforced is economically sound seems to be generally admitted, and the decision would hardly have been different had the whole industry been built up from the beginning. There is not space here to enter into elaborate calculations, but brief consideration will show that the established policy is upon the whole the judicious one. There is no probability that it will be changed in any important degree until new conditions arise with regard to ore supply, and this is not likely to be the case for many years to come. The one experiment which has now been undertaken in the opposite direction will, we believe, serve still further to confirm our belief.

ROBERT OLDS.

Philadelphia, Penn., Feb. 16, 1915.

The Nickel Situation

Misther Editor,

'Tis a funny thing, the way cuss-words creep into a language an' get to be rayspictable; an' how other words start rayspictable an' get to be worse than cuss-words in other nayshuns.

Siveral hundred years ago the Germans, intirely ign'rant av the fact that the Chinees knew all about the metal which is first cousin to cobalt, tried to smelt copper out av some av its ores. They had bad luck; havin' to use an extry amount av fuel; an' whin they got raysults the product was off-color an' not marketable as pure copper. So they cussed it out an' called it *kupfer-nickel.* Jist look up the dirrivashun yoursilf. Whin a Swede diskivered that it was a new kind av a metal, the opprobryus name stuck.

Whin the Germans found out the saycrit, they began to immytate the Chinee alloy av copper, zinc an' nickel; calmly appropriatin' it as their own invinshun under the name av German silver. Nickel is now perfectly rayspictable, in spite av a few excited Canadyans; an' can be used in thousands av ways without comin' in contact with the word German.

I wud vinture to state without fear av contradicshun, that there is not wan man, woman or child in the whole United States but what uses somethin' ivery day with more or less nickel in it. An' we're all neutral, at that; or ought to be. Tell the Canadyans not to worry about nickles. I use plinty av thim, an' can use all their mines produce. A nickel by anny other name wud be as fleet, an' waste its substance on a trolley fare. Ivery American child is born with a silver spoon in his mouth; an' whin they save enough coupons they can get a dozen av American-silver spoons built on an 18% nickel base. They get on the ice with a pair av nickel-steel skates; an' manny's the felly that starts on a skate with a nickel drink. Whin they have tin, 'tis time for a copper.

BILL MCGINTY.

New York, Feb. 27, 1915.

Herbert Clark Hoover

In publishing the article by Will Irwin, the well-known writer, about Herbert Clark Hoover in the JOURNAL of Jan. 30, the editor of the JOURNAL surmised that there were probably numerous errors in Mr. Irwin's report, but thought the latter sufficiently interesting to be printed anyhow. The editor's surmise was correct. Mr. Hoover's career is wonderful enough without having to add romantic and incorrect details. He was not expert of the North China Government. There is no North China Government. He was not prospecting when the Boxers broke out. His worldly fortunes had nothing to do with the alleged government. He did not join the correspondents. He did not help in reconstruction of railways.

At the time of the Boxer troubles he was in the employ of the Bewick, Moreing & Co. at a very good salary. The story of the coal concession can be found in the court records of Great Britain.

Mr. Hoover is such a remarkable man that somebody ought to get an authentic account of his life and activities. He is certainly the most remarkable mining engineer, from a financial standpoint, that has yet appeared.

San Francisco, Feb. 12, 1915. W. H.

Editorials

The Situation in Spelter

Since our last review the price for spelter advanced to figures previously unrecorded. Spot spelter for sale exists anywhere in but trifling tonnages and commands prices measured only by the exigencies of the buyers. Spelter for prompt and near-by delivery is almost as scarce and almost as dear. Spelter for the months of April and May is more plentiful, but previous to this week was obtainable only at moderate concessions. With spelter for June and later deliveries it was a different story. This meant that smelters had sold much of what they expected to make up to the end of May, but not so much beyond that date, although there was no doubt that many sales running forward to August had been made.

What was the situation of the market is rendered clear by a little reflection. The mainspring of the advance was the buying from abroad to supply the deficiency resulting from the isolation of the smelters in Germany and Belgium, and in the north of France. American consumers woke up, too late, and found that early supplies had been practically exhausted by the foreign buying. Those consumers who had entered into contracts to deliver brass, galvanized goods, etc., and had not previously provided for the necessary spelter, were caught short and were obliged to pay almost any price demanded. They came into competition with the contractors for war material, among whom price was more or less a matter of indifference, and the ugly situation was made worse by the pudding-sticks of reckless speculators.

Now as to the position of the smelters: Even before the beginning of January they found themselves receiving increased supplies of ore. When the great advance in spelter obtained real headway every zinc miner in North America exerted every effort to produce all he could, and supplies to the smelters increased rapidly. The smelter taking in ore sold spelter against it as rapidly as he could, and in the main his sales were made at the lower levels of the rising market. As ore supplies increased beyond the immediate smelting capacity the smelters found themselves obliged to sell further and further ahead, or else run the risk of carrying a large supply of high-priced ore in the face of the collapse that was bound to come sooner or later. Therefore in order to protect himself the smelter was not only willing to sell deliveries beyond the customary two-months and three-months contracts at large discounts, but was anxious to do so. Indeed, his solvency might depend upon his ability to do so.

The misunderstanding of these conditions led to some strange vagaries. In the Joplin district, for example, the mine operators have been holding mass meetings to protest against the action of the smelters in refusing to pay what they, the miners, would like to get for their ore. Because some belated consumer is understood to have paid 11c. for a carload of spelter out of warehouse in New York, it has been reasoned that the St. Louis price ought to be 11c. minus 0.17c.; and that the entire Joplin production ought to sell per ton of ore at about eight times the St. Louis price for 100 lb. of spelter. A good many of the fancy prices named for spelter have been based on bids which in reality have been for quantities and deliveries that nobody could supply, a fact well known to the bidder, who could, for purposes of his own, bid almost any price with impunity.

The effect of all this upon the uninformed public was to make it think that the highest price mentioned in any newspaper, responsible or irresponsible, was the true price for spelter and anything else a malevolence. Upon the demand of the Joplin operators the Attorney-General of Missouri started an investigation to find out why the smelters would not pay more for ore, to pry into the cherished myth of a zinc-smelters' trust, etc. The simple fact, was, of course, that the price paid on the forced purchase of a few carloads of spelter did not represent the basis on which an output of 35,000 to 40,000 tons a month was being marketed, or could be marketed; and smelters were not going to buy ores on any basis higher than that upon which they could sell spelter.

The Joplin ore market, being an open market, the smelters were able to meet the situation by refusing to purchase ores except at a price which they figured would be reasonably safe. The smelters taking in ore on sliding-scale contracts, on the other hand, a system that obtains especially with respect to the Rocky Mountain ores, were not such free agents. They were obliged contractually to take in ore right along, whether or not they could sell the spelter against it. The situation was so distinctly adverse to the smelters that the concern taking the Butte & Superior ore notified the mining company on Mar. 1 that thereafter it would refuse to accept any more than the minimum stipulated in the contract, which would have had the effect of greatly curtailing the Butte & Superior production had not that company been able to make smelting arrangements elsewhere for the surplus. In fact, arrangements were promptly made with the American Zinc, Lead & Smelting Co. for the treatment of the surplus Butte & Superior ore at Caney and Dearing, which smelteries had previously been idle. While the details of this arrangement have not been made public, it may be assumed with certainty that the mining company has guaranteed the smelting company against loss, or that the smelting company is going to handle the ore on toll for the mining company, which must subsequently sell its spelter as best it can.

So much for the purely technical position of the ore and spelter markets. Considering the situation broadly, the factors that we pointed out in our last previous review developed rapidly. About all of the active smelting capacity of the United States is now in use, the idle furnaces consisting only of a few here and there which are cold for necessary repairs. In Kansas and Oklahoma everything is running. A good deal of the moribund capacity, including that at Caney, Dearing, and Altoona, is being put into use. There is even a contemplation of putting the old plant at Pittsburg, Kan., rated

as inactive, in operation again. Work on the two big plants building is being rushed as rapidly as possible, and one by one their furnaces are going into commission.

There is a plethora of ore supply. Not only have the big American mining companies increased their outputs to the maximum possible, but a large tonnage of Broken Hill ore is on the way hither. The last was a development that was bound to come. A basic cause for the recent situation was the inability to smelt the Broken Hill ore in Germany and supply Great Britain with spelter from there. As soon as the price for spelter rose above a certain figure, it was manifest that all restrictions of unfavorable geography, unfavorable metallurgical practice, etc., would be nullified and that Australian ore would come here so long as we had capacity to take it; and as was pointed out in a recent article, our total smelting capacity is largely, possibly as much as 50%, in excess of the use of it in 1914.

On the other hand, the consumption of spelter for industrial purposes is suffering severe contraction. Reports from the galvanizing districts of Great Britain and the United States agree respecting this. Increasing production and decreasing consumption are bringing about the cure of the distressful situation that has lately existed, and still exists. On the whole it is fortunate that the collapse in spelter which occurred this week was so drastic. If the slump goes further and the squeeze in this industry be ended very soon, as it will be according to the present outlook, we may be saved from the troubles that always follow a long period of inflation.

Tendencies in the Location of the Iron Industry

In our discussion columns is to be found an able presentation of the factors usually given as determinative in the selection of a location for a new steel plant, but from which, in part, we differ.

The reasons generally assigned for the location of the iron industry have dealt chiefly with the question of whether the ore, of which about two tons are required per ton of iron, should be brought to the coal, of which about one and one-half tons are required, or *vice versa*. The coal is frequently coked before shipment and the weight of coke required is only about one ton per ton of iron against nearly twice as much for the ore; but many plants have been located much closer to the coal than the ore, nevertheless. This fact has not unaturally troubled many who have attempted to work out the underlying causes.

It may be freely admitted that the location of iron-manufacturing centers is a matter of freight charges; but not, as is commonly assumed, of freight on raw material only. Obviously there must be included freight on the finished product to the point of consumption. If we were to consider the establishment of an iron works in a country entirely without such works, knew that each person would consume a given weight of iron per year, and knew also the tonnage of the proposed works, we should know how much population was required to consume the product and from the density of the population in the country we could calculate the average distance the product would have to be hauled to reach the consumer, and the freight for this haul added to the freight on the raw materials would constitute the total freight charge on the product. It is this which should be kept a minimum. It would clearly be an accident if the point which gave the lowest combined value for the three were at either the ore mines or the coal mines.

The correct location would obviously be the equilibrium point of the three forces acting through the coal mines and the ore mines and the center of population. We could, without much trouble, make a model which would illustrate the action almost perfectly. We need only to put a peg at the center of population for a given district and one each at the ore mines and coal mines, fasten together at one end three pieces of rubber cord of equal length, whose lengths were proportional to the rate of freight per mile of the quantity of material equivalent to a ton of finished product, and attach the free ends to the corresponding pegs; the junction point would be the equilibrium point and would indicate the proper location of the plant. The strength of the forces acting is profoundly affected by the means of transportation available (whether water or rail) and the location of the equilibrium point is obviously influenced to correspond. The sum of the tensions in all three strings measures the disadvantage under which the district must labor.

We can see this law demonstrated in the growth of our iron-producing centers. At the time of the Civil War, Pittsburgh was nearly the center of population of the country, and it made, for the next 20 years, the vast bulk of the steel produced, although there was a considerable center in eastern Pennsylvania and New Jersey, in which the fuel, the ore and the consuming population, were all close together and the sum of the tensions was small.

As the West became settled, the center of population traveled west, first to Ohio, then to Indiana, and then to Illinois, where it is now; simultaneously the Chicago district developed as an iron center although its freight on ore is but little less than that to Cleveland and Buffalo while its freight on coal is very much higher; but it is the center of a great consuming district and its freight on finished product is low enough to make the sum of the string tensions small. Later still, Colorado became an iron-producing center, in spite of many disadvantages, because of its location near the center of a consuming district which is far removed from any other source of supply. The sum of its string tensions was high but that of any other iron-producing district is higher in its territory. The present construction of a steel plant in Duluth is a further example: The freight on both coal and ore assembled there has been very low for many years; but until the population of the Northwest became large enough to support railroads whose tonnage of steel consumption runs into six or seven figures, it did not pay to build a steel plant there. The freight on the finished product to points of consumption would have been too high.

At Birmingham, the conditions are similar but more marked. The ore and coal are in closer proximity than anywhere else in the known world, the tension in these two strings is almost nothing but the freight to outside consuming centers was so great as to more than counterbalance the advantage; the tension in the single string was more than that of all three at other iron-producing centers and the district made much pig iron but very little money until a local consuming center was built up.

In the future, the attraction of the center of population

will be increased even over what it is now; because the gas, which is a byproduct in the production of coke, is of vast value for public heating and lighting and the power which can be produced with surplus gas from the furnace will be increasingly valuable for public utility purposes.

These products are consumed in steel mills in greater quantity than they are produced by its coke ovens and furnaces, so such works are not to be considered as sources of supply for these products and their location will not be so strongly affected; but the merchant furnace will have gas and power for sale and will more and more be so located that it can dispose of them to good advantage without building long pipe or transmission lines; that is, near centers of population.

That is, in the future, as we grow more efficient there should be an intimate connection between the iron blast-furnace plant and the public utility, and especially the public utility serving large centers of population.

Anaconda Adopts Flotation

We have previously hinted that the newly developing art of copper hydrometallurgy might not become so important, or rather of so general application, as was expected, for the reason that a superior substitute in many cases was probably forthcoming. We had reference to the substitution of the froth-flotation process of mineral concentration in many cases where hydrometallurgical extraction had been contemplated. Among these was Anaconda.

It has lately been officially announced by the Anaconda company that its elaborate program of slime concentration and leaching of tailings, which was published less than one year ago, is to be abandoned for the major part, flotation being substituted. The new round-table plant, that model of ingenuity and excellent engineering design, is to be dismantled. The sulphuric-acid plant and the first unit of the leaching plant, both of which are nearly completed, will be carried on, but will be used only for the treatment of the great accumulation of old tailings below the mill. The finishing treatment of the current make of tailings will be flotation.

The reason for this swift and radical change of policy was simply that is was demonstrated that the flotation process would make more money for the company. It will be recollected that in an article in the JOURNAL last May, wherein the plans of the Anaconda were described, it was mentioned that flotation experiments were to be inaugurated, and even then there was thought to be a possibility that the flotation process might be superior for a certain part of the treatment. The results of the experiments went far beyond what the Anaconda staff then thought they would. That the change of plan was so completely, boldly, and swiftly made indicates conclusively that the Anaconda staff rides no hobbies and is not fettered by prejudices or preconceived ideas.

In referring to the starting of milling in the Juneau district by the Alaska Gold Mines Co., it was inadvertently stated, last week, that stamps began dropping in the first 1500-ton unit of the mill on Feb. 18. This inadvertence—referring to stamps instead of rolls—will probably be apparent at once to readers of the JOURNAL, as reference has frequently been made to the fact that the Alaska-Gastineau mill would be a roll-crushing mill in contradistinction to the Alaska-Juneau's stamp mill. Both of these mills are under excellent technical direction and will offer an interesting opportunity of comparing the two types of equipment for the milling of gold ore on a large scale.

BY THE WAY

We hereby quote, in part: "Every man accepted by ——— was a murderer. He would have no weaklings. No one can tell how many victims his associates had before they went into his alliance; but it is sure that novices in man-killing were not desired, nor any one who had not been proved of nerve. ——— soon had so many men that he set up a rendezvous at points on all the trails leading out from ——— to such mines as were producing any gold. One robbery followed another, until the band threw off all restraint and ran the towns as they liked, paying for what they took when they felt like it, and laughing at the protests of the minority of the population, which was placed in the hard strait of being in that country and unable to get out without being robbed." No, gentle reader, this is not an account of Zapata or any other bandit leader in Mexico. The text is taken from Emerson Hough's "The Story of the Outlaw" and portrays the exploits of one Henry Plummer in Montana and Idaho about 50 years ago. It is but a sample of many tales of violence and pillage. Measured by the standards of some of the pioneers of our Western civilization, Francisco Villa is elegible for admission to the infant class of a Baptist Sunday School; while Zapata may be likened to the mischievous boy who catches flies on the back of the church pew.

General Obregon of the "Constitutionalista" army of Mexico (1915 Carranza Model, self-starting, internal-combustion type) has been quoted as naively remarking: "Every day opportunities are presented to me for splendid business deals, which I have rejected with indignation for to accept them would be like surrendering into my enemies' hands. If I were to remain in this city two months, perhaps I should in the end be overcome and cease to be honest. I am human and, therefore, capable of being corrupted, but so far I have succeeded in clinging firmly to my principles." This is very much like the story of the army sergeant in the Filipinas who was visited for several days in succession by an astute Chinese gambler who desired to operate without molestation. Each day the celestial would lay on the sergeant's desk-table a pile of money, daily augmented, gazing silently but inquiringly at his vis-a-vis. Recurrently a silent yet eloquent gesture of the saber arm would indicate the scornful spurning of the offered bribe. Finally, however, when the bait reached the interesting sum of $10,000, the gesture was transferred to the right boot and made kinetically effective; while the silence was broken with "git the ——— out of here, you ———, you're gettin' too ——— near my price." If the Mexican patriots would only fill Boss Tweed's standard specifications for an honest man (i.e., "one who will stay bought"), perhaps someone could arouse popular interest in a movement to buy up these manager dogs of Mexican politics.

PERSONALS

S. S. Fowler of British Columbia was a recent visitor in New York.

J. R. Finlay is going to Nevada to attend to some professional work.

John L. Malm of the Malm-Wolf Co. of Denver, has gone to Chicago on professional business.

H. E. Tuttle, formerly with the Edgar Zinc Co., is now with the Fink Furnace Co. at Chicago, Ill.

F. G. Lasier, of Detroit, Mich., is at the National Hotel, Cripple Creek, Colo., during the month of March.

E. G. Spilsbury has gone to Montana, where he expects to be engaged until about the end of March upon professional work.

Wilkinson, Currie & Amigo have opened offices as mining engineers in the First National Bank Building, Goldfield, Nevada.

W. Earl Greenough, manager of the Marsh Mining Co., Wallace, Idaho, has been in New York for the last two weeks on business.

Prof. Roswell H. Johnson of the firm of Johnson & Huntley, geologists, is in Washington in connection with the Osage hearing.

Edward K. Judd, for some years past instructor in the Columbia School of Mines, New York, has been promoted to assistant professor of mining.

C. B. E. Douglas has resigned his position as engineer for the Amparo Mining Co. at Etzatlan, Jalisco, Mexico, and has gone to England to enter the British Army as a volunteer.

H. W. Kitson, formerly superintendent of the British Columbia Copper Co., Ltd., operations at Princess Camp, B. C., has accepted charge of the sampling department of the Arizona Copper Co. at Morenci, Arizona.

Doctor Vogelsang, general manager of the Mansfeld copper mines, and Herr Francke, his metallurgical aid, were called to the colors, and both are at the front near San Quentin, France. In the meanwhile the mines and works are being run by their staff.

A. E. Bendelari, who has been manager for the Underwriters' Land Co., of Joplin, Mo., has resigned his position to become general manager of mines with the Picher Lead Co. Under Mr. Bendelari's management development work will be pushed on five different properties, shafts will be sunk and mills erected.

Dr. Pierre de P. Ricketts announces that hereafter he will be identified with Ricketts & Co., mining, metallurgical and chemical engineers, with offices and laboratories in the Eighty Maiden Lane Building, New York. The firm will undertake examinations of mines and properties; advice as to development and operation; determination of method of ore treatment; assays and analyses of all materials and products.

O. M. Bilharz has resigned from the consolidated St. Joe and Doe Run lead companies, where he occupied the position of general technical manager. When he took the superintendency of the Doe Run Lead Co., 21 years ago, it was operating its single mine at the town of Doe Run and was producing about 4000 tons of lead yearly from a 500-ton mill. Under his management, the Flat River mines were opened, the new mill recently finished at Rivermines of 4000 tons daily capacity and the output of the Doe Run Co. has grown to over 40,000 tons of lead per annum. He also designed and built the Leadwood plant of the St. Joe Lead Co., a 2000-ton unit.

Dr. John H. Banks, formerly of the firm of Ricketts & Banks, announces that he is now located at 61 Broadway, New York, where he will continue the mining, metallurgical and chemical work in which he has been continuously engaged for the past 30 years. Attention will be directed especially to the examination and development of mines and mineral properties, to the problems of ore treatment, and to the testing and improvement of metallurgical processes. Facilities for test treatments of ore on a practical scale continue as heretofore, and newly equipped laboratories enable him to undertake investigations based upon the most recent advances in metallurgical and milling practice.

Captain William H. Johnston, who has been in charge of the mines of the Oliver Iron Mining Co. on the Marquette iron range since that company was organized, has tendered his resignation and will be succeeded by Captain Frank E. Keese, who has been his assistant since 1905. Captain Johnston is well advanced in years and will have his name placed on the company's pension roll. He entered the employ of the old Lake Superior Iron Co. almost 40 years ago, starting in at the bottom and ending as general manager. When that company was taken over by the Oliver he was made manager of all the mines of the new company on the Marquette range. He has always taken an active interest in the mining affairs of the Lake Superior district and is one of the prominent members of the Lake Superior Mining Institute, serving as president during 1914.

Captain Keese started his mining career on the Mesabi range in the early days, being stationed at the Genoa mines for some time. Later he was transferred to the Marquette range, where he was placed in charge of the Moore mine at Palmer. When operations were suspended there he went to Ishpeming to become assistant to Captain Johnston in charge of the underground operations.

OBITUARY

Dr. James Geikie, the noted geologist and president of the Royal Society of Edinburgh, died at Edinburgh, Scotland, Mar. 2, aged 76 years. He was born in Edinburgh, and was emeritus professor of Geology and Mineralogy at the University of Edinburgh, and dean of the Faculty of Science at that institution. Prof. Geikie, after his graduation from Edinburgh University, entered Her Majesty's Geological Survey in 1861. In 1869 he was appointed district surveyor, and in 1882 was the occupant of the Murchison Chair of Geology at the university. Prof. Geikie had been awarded the Brisbane Medal of the Royal Society of Edinburgh, the Murchison Medal of the London Geological Society, and the Gold Medal of the Royal Scottish Geographical Society. He was one of the founders and past president of the Royal Scottish Geographical Society, and honorary editor of the "Scottish Geographical Magazine." Prof. Geikie wrote extensively on geological topics, his first book being "The Great Ice Age," published in 1874, and his last, "The Antiquity of Man in Europe," published last year.

John Gray, who died at his winter home in Los Angeles, Calif., Mar. 3, was one of the best known and most successful mining operators in the Black Hills district of South Dakota. Born in Lancashire, England, Feb. 28, 1846, he came to the United States when 22 years of age, locating at Scranton, Penn. Later he removed to Rock Springs, Wyo., following coal mining, and in the seventies was a resident of Cheyenne. Becoming friendly with "Wild Bill' Hickok he joined the latter's wagon train and journeyed to the Black Hills, then the mecca of thousands of gold seekers, in the spring of 1876. He was fortunate in securing valuable placer property on Deadwood Gulch, owning and working No. 3 above discovery, from which he realized a small fortune. With the working out of his claim he again followed the lure of the new diggings and joined the rush to the Cœur d' Alene district in Idaho, remained a few years and returned to the Black Hills permanently to remain. The greatest achievement of his life was the equipment and operation of Wasp No. 2 mine, at Flatiron, where handsome profits are earned on the mining and milling of a $2 gold ore. He was the largest individual holder in this enterprise, owning one-fifth of the capital stock. He was a director at the time of his death; a year ago he resigned the general managership, which he had held for years, on account of his failing health. A man of remarkable force of character, aggressiveness and untiring energy, at all time liberal in the support of new enterprises, his death will be sincerely mourned in the community in which he resided. Interment will be made in Deadwood, beside his wife, who died in 1897.

SOCIETIES

Mining & Metallurgical Society of America—The presentation of the annual gold medal of the society to Robert Hallowell Richards will take place at the Chemists Club, 52 East 41st St., New York, on Thursday evening, March 18. There will be a formal reception at 6:30, followed by a dinner. Tickets may be obtained from F. F. Sharpless, 52 Broadway, New York.

American Institute of Electrical Engineers—A meeting was to be held in the Engineering Societies Building, New York, March 12. This was a joint meeting with the New York Section, of the American Electrochemical Society, and two papers were to be presented as follows: "Fixation of Atmospheric Nitrogen," by Leland L. Summers, and "The Cyanamide Process," by Frank B. Washburn.

Editorial Correspondence

SAN FRANCISCO—Mar. 3

The Mining, Irrigation and Power Ditch of the San Francisco-Oakland Terminal Power Co. was sold at public auction at Placerville, Feb. 23, to satisfy a court judgment on the foreclosure of a mortgage for $47,972 and costs. The property consists of 30 miles of main trunk canals and about 100 miles of laterals, chiefly in Eldorado County. The intake is located on American River. The laterals of the main trunk extend to Coloma and Eldorado. While the bulk of the water is procured from American River, reserve supplies are maintained at Silver, Echo and Medley Lakes. The main canal was built in the early '70s, chiefly for the purpose of hydraulic mining and was used extensively for this purpose until 1887 when the anti-débris law went into effect. The situation of the hydraulic mines and the indisposition of the owners of such mines caused the cessation of hydraulic mining in the region covered by this ditch system. Subsequently, the canals were used for other mining and power purposes, and in recent years have carried water for irrigation of fruit orchards in Eldorado County. The system has cost a large amount, estimated from $1,000,000 to $3,000,000. It is still valuable property, but has been shifted about in ownership so often and made so little use of that it will require improvement and direct economical management to make it a paying system. It was formerly owned by the Eldorado Water & Deep Gravel Mining Co. and sold later to C. N. Beal who afterwards transferred it to the Sierra Nevada Water Supply Co. This company held it but a short time and transferred it to the San Francisco-Oakland Terminal Power Co. The Placer Gold Mining Co. succeeded the Eldorado Water & Deep Gravel Mining Co. and was plaintiff in a recent suit at court against the power company.

Rules For Inspection of California mines are being formulated by a committee selected by the California Metal Producers' Association and the safety department of the State Industrial Accident Commission. The committee is composed of H. M. Wolfiin, mining engineer of the Industrial Accident Commission, N. S. Kelsey, manager of the Argonaut mine, Arthur Foote, superintendent of the North Star mine, A. F. Anderson of Los Angeles, manager of the Needles smeltery (George W. Meltcalfe, manager Mammoth Copper Co., alternate), James Giambruno of the Amador County Miners' Union, J. C. Williams of the Nevada County Miners' Union, and E. M. Arandall representing the miners in the Randsburg region. The committee included the mining laws now on the California statute books in the rules so far adopted. The rules are prefaced with a summary of the Workmen's Compensation and Safety Act and a definition of the class of mines to which the rules are applicable. The following provisions were made: For reports to be made by superintendents to the office of the inspector and for reporting accidents by employees to employers; keeping first-aid materials at the mines; preparation of mine maps showing safety precautions; lighting and candles, safety pillars, skips and cages, artificial-breathing apparatus; prohibiting use of intoxicating liquors; storage of inflammable materials at the surface, in addition to the rules for storage and use of explosives provided by law; hoisting rules, boiler inspection, guard rules, sanitation, dry closets, drinking water, change houses, ventilation; shaft protection, ladders and ladder ways, safety gates, timbering, installation of electrical machinery. After being completed to the satisfaction of the committee, copies of these rules will be sent to operators and miners and others interested in mining for discussion and criticism. Then a public hearing will be held by the commission and the rules as amended will be submitted for approval. After such approval, under the provisions of the Workmen's Compensation Law, these rules may be enforced in like manner as the statutes would be enforced.

DENVER—Mar. 4

That Shipment of Rich Ore from the Cresson mine, of which so much has been heard in the past few weeks, finally got back to the Copeland sampler where it was first sampled and purchased. It is now being mixed with low-grade ores in such proportion as to bring the gold content below 50 oz. per ton, which grade the Golden Cycle company will accept for cyanide treatment in the Colorado City mill. In these days it is quite a job to market bonanza ore. A 68-ton lot of Cresson "reduced" high-grade ore was shipped recently and while this ran 65 oz. it is understood that settlement was made and that the lot netted about $80,000. Souvenir reproductions of the $468,637.29 check paid by the Copeland Sampling Co. to the Cresson Gold Mining & Milling Co. were given each of the business men from Denver, Colorado Springs and Pueblo in last week's special visit to the Cripple Creek district.

All the metal-mining property of the Golden Cycle Mining Co. has been sold for $1,500,000 to the Vindicator Consolidated Gold Mining Co. The purchasing company declined to consider the acquisition of other holdings of the Golden Cycle company, consisting mainly of the cyanide plant at Colorado City and large areas of coal land near Colorado Springs. It is surmised that the coal and mill properties will be retained and operated by the present holders of the option from the Golden Cycle company as such action will give them virtual control of the milling of custom ores shipped from the Cripple Creek district, the same interests already controlling the United States Reduction & Refining plant at Colorado Springs.

BUTTE—Mar. 4

The Pending Litigation between the Anaconda company and the Pilot-Butte has taken on a new phase by the Pilot-Butte filing an application Feb. 25 to dismiss the latest order to show cause in the case in which the Anaconda company claims ownership of veins on which the Pilot-Butte had been working. The original order to show cause why a permanent injunction should not issue was obtained Oct. 8, 1913, and the case was heard by Judge Lynch last June and taken under advisement. On Feb. 23, 1915, another injunction was asked in the same case. It was supported by affidavits to the effect that the Pilot-Butte has recently been mining in the disputed ground, which was supposed to be protected by the temporary injunction of 1913. On this showing the Judge issued an order to show cause on Mar. 15 why the Pilot-Butte company should not be enjoined permanently. In the application for dismissal made Feb. 25, it is set out that the order of October, 1913, described the vein from which the Pilot-Butte was restrained from taking ore and that if any ore is taken now, the proper proceedings will be to have the officers cited for contempt. It is claimed that the Anaconda's present proceedings is an effort to increase in scope the area in dispute and is otherwise simply a repetition of the former application.

Labor Union Affairs—After last summer's labor troubles had subsided, the Miners' Union presented the City of Butte with a claim for $138,291 damages for the destruction of the Miners' Union hall, loss of books and other items. When the city refused to make payment the matter was taken into court. Judge Lynch took action on a motion to strike several vital paragraphs from the complaint of the union by lopping off $47,800 from the bill presented. Thus an amount of $90,491 still stands against the City of Butte which, the complaint states, made no effort to prevent the mob from destroying the hall and therefore became responsible and liable for the damages as asked.

The ruling of the Supreme Court handed down Feb. 28 in the cases of Muckie McDonald, Joe Bradley and W. Winchester, former officers of the Butte Mine Workers' Union, now in the state prison for kidnapping, clears up the case of Burt Riley, former president of the Butte Miners' Union No. 1 who is charged with kidnapping William Leduc and who accordingly will be tried in Bozeman before a Gallatin County jury. The case promises to be a hard-fought one and holds much interest for the miners of the district, as Riley was a central figure in the circumstances which led up to the June rioting. The Supreme Court's decision was on the contention of Muckie and his staff that kidnapping was a misdemeanor instead of a felony and that therefore they were unlawfully detained in the penitentiary. This the Supreme Court denied.

SALT LAKE CITY—Mar. 4

Drain Tunnel for Tintic—There has been some talk recently of driving a tunnel which will drain the south end of the Tintic district. The plans call for a tunnel five miles long to be driven west from Goshen valley, starting at an elevation of 5000 ft. Such a tunnel, it is estimated, would cost

in the neighborhood of $1,000,000. The promoters are L. A. Martin & Co. brokers of this city. In addition to unwatering and draining certain mines in the Silver City section, and providing transportation and outlet for ores at a point where mills could be built, and there are railroad facilities and short haul to the smelteries, etc., it is thought revenues could also be derived from electric power plants and irrigation. Such a tunnel would undoubtedly drain the porphyry area, but would be above the water level of the most important mines of the district in the central and northern part of the camp which are in the limestone. If the tunnel started at an elevation of 5000 ft. and had a grade of 10 to 20 ft. to the mile the elevation of the tunnel near the face would be about 5075 ft. The water level at Eureka, as shown by the Gemini, Centennial-Eureka, Chief, etc., is at approximately 4800 ft. elevation (4793 to 4807 ft.), so that the water level of the mines in this section would be 200 to 300 ft. below the drain tunnel. Possible benefit to this part of the camp, if branches were extended from the tunnel, would consist in enabling pumping to the proposed tunnel level, instead of raising water to the surface. The 5000-ft. contour runs along the base of the range and a lower elevation for the tunnel-site could not be obtained without driving a much longer tunnel, in which case a few hundred feet only could be gained, the elevation of Utah Lake being 4515 feet.

SEATTLE—Mar. 1

Gold Output of the Iditarod District last year has proved somewhat of a disappointment to those who anticipated a total gold production of about $3,000,000. The latest available figures which are about correct place the entire production of the field at $2,059,200 and is but little greater than the season of 1913, despite the fact that weather conditions were excellent for opencut mining throughout the district. The main reason ascribed to the falling off in the expected output is that the two dredges were compelled by unfortunate circumstances to close down much earlier than was expected. The Yukon Gold Co.'s dredge on Flat Creek operated fully three weeks longer in 1913 than in 1914, but the dredge of Riley & Marston on Otter creek was compelled to close down much earlier than was expected, owing to serious accidents in the machinery.

Activity Over New Strike made on the Stewart River is evidenced by the filing of 25 applications for claims at the Dawson gold office. The discovery was made originally by Carl Loeffler on Brewer Creek, which flows into the Stewart a few miles below Barker.

NEWPORT, ORE.—Mar. 1

The Lease on Lakes Abert and Summer, of Lake County, given by the state land board has been ratified by the Legislature. The lease runs for 40 years and Mr. Moore and his associates have notified the Land Board that work will be commenced at once and that the improvement and development will cost $7,000,000. It is said that $2,000,000 will be spent on a pipe line running from the lakes to the Columbia River a distance of 270 miles and that $5,000,000 will be spent in manufacturing plants at the end of the pipe line on the Columbia. This is the greatest development project Oregon has seen and the mineral salts of these lakes will be manufactured into a number of products. The work will employ many men. By the terms of the lease Mr. Moore guarantees the state a minimum annual royalty of $25,000.

MARSHFIELD, ORE.—Mar. 1

Financial Conditions are not improving in this section; if anything they are getting worse except the price of supplies is being reduced some and this benefits the laboring class. Some of the mills running have had to delay their pay-day.

A Rich Gold Strike is reported to have been made on the head waters of Lobster Creek, Curry County, about eight miles to the north and west of Agness on the Rogue river which is opposite the mouth of the Illinois River. The report is unconfirmed so far, as that section is under several feet of snow.

HOUGHTON—Mar. 9

Kaolin and Manganese, in Ontanagon and Keewenaw counties respectively, have been reported in the local press in the Copper Country recently. An investigation of these reports reveals that the kaolin deposit referred to is probably a deposit of ordinary clay along the banks of the Ontanagon River near Rockland, Mich. An attempt was made to have the deposit developed several years ago, but little was accomplished. The manganese deposit is at Manganese Lake, near Copper Harbor, and attracted some attention in 1900 and 1901. The property was not developed to a producing basis and is considered of doubtful value.

Such Insistent Demand for immediate shipment of copper at this season of the year has never been equaled in the history of the producing industry in the Lake Superior copper country. As a rule, all of the smelters here begin to accumulate stocks of refined copper in March and keep piling it in the yards until navigation opens, thus to take advantage of a cheaper water freight rate. But the smelters are shipping daily to New York. Two hundred thousand pounds left in one shipment from the Calumet & Hecla works yesterday, following a shipment of 300,000 lb. the day before. Report has it that this company is selling direct to the French government.

Production for February from the mines of the Lake Superior district ran well over 15,000,000 lb. and it was a short month. Every producing mine now is working under conditions which prevailed just previous to the Western Federation of Miner's strike and the percentage of copper per ton of rock is, as a general average, a little higher than it was at that time. This is due to the material betterment generally in the underground openings at several of the mines, notably Baltic of the Copper Range Consolidated, Mohawk, and Quincy. The conglomerate lode of the Calumet & Hecla is also showing a little better than its average of recent years, but this is offset by the increased tonnage without any increase in contents of the rock from the Osceola lode of the Calumet & Hecla. At the Mohawk mine the efficiency of labor has played a wonderful part in the general improvement in the quality of rock coming from the newer openings.

AUSTIN—Mar. 3

Oil Strike—What is probably the most significant oil strike that has been made in Texas for several years has been made near the town of Thrall, 35 miles northeast of Austin. At a depth of 1400 ft. a gushing flow of oil was struck in a well that was being bored by a local company, headed by Dr. W. F. Wallace. The flow from the well was approximately 500 bbl. per day. There is much activity in the sale of leases, some of the owners receiving as high as $100 per acre bonus.

That the scene of this oil strike is nearly 200 miles from any of the existing producing oil fields is believed to indicate that a new producing territory is about to be opened. Already more than a dozen well-drilling rigs have been shipped to the new scene of operations.

BISBEE—Mar. 5

Calumet & Arizona has acquired between 75 and 80% of the stock of the New Cornelia Copper Co., at Ajo, Ariz., 44 miles from Gila Bend, to which main-line connection it contemplates building a railroad this spring. The Cornelia was at one time held under option by the General Development Co., and $20,000 was spent on the property under direction of J. Parke Channing. Later it was leased to its former manager who shipped several hundred tons of 4% copper ore to the C. & A. smeltery at Douglas. The C. & A. secured an option and have developed to date, by drilling, 40,000,000 tons of ore, averaging 1½% copper. The capping of this deposit is said to yield to a leaching process developed by the C. & A. engineers. Calumet shareholders of the C. & A. are not altogether pleased with the New Cornelia absorption scheme, claiming it will shut off dividends for three or four years. They believe that financing of a big low-grade property like Cornelia would better be done by a bond issue. There is talk of organized opposition to the scheme at Calumet.

TORONTO—Feb. 27

Government Control of the Nickel Industry was the most important subject considered at the annual meeting of the Ontario Associated Boards of Trade, held Feb. 25, at which over one hundred representatives of the principal cities and towns were present. After a thorough discussion, which showed considerable difference of opinion, a resolution was adopted by a small majority approving the proposed appointment of a commission of investigation by the provincial government, and declaring it to be in the interest of Canada and the British Empire that the refining of all nickel, copper and matte should be done in Canada under Government control.

EDMONTON—Feb. 27

Discovery of Gold was made recently in the Herb Lake district north of Le Pas, Manitoba, a short distance from the new railway line from Le Pas to Fort Nelson on Hudson Bay. A second find 100 miles farther on was made at Wintering Lake, also adjacent to the railway. Eight nuggets of well rounded placer were brought in to the Pas. Following their arrival, J. P. Gordon, assistant chief engineer of the Hudson Bay railway, left immediately on a special train to investigate.

Bar Diggings on North Saskatchewan River have been regulated by an order-in-council. Persons are now allowed to operate a strip of land 100 ft. wide along high-water mark of the river and extending thence into the river to its lowest water level, on payment of fee of $1 to the mining recorder, who will issue certificate.

The Mining News

ALASKA

ALASKA COPPER CORPORATION plans to do but little work during coming summer. Capital has been raised for development work on larger scale but it is impossible to freight machinery and supplies to mine before next winter. Expect to do much work during summer of 1916. Company shipped ore assaying 55% copper to Tacoma smeltery several years ago. A. B. Iles is manager.

REX CREEK, tributary to Chititu Creek, which is itself tributary to Nizina River in Copper River district, is scene of considerable activity. Two sets of laymen are working on J. S. Taylor property. Powell & Cooper, on upper lay, have 25 ft. of tunnel in pay and Woodward, on lower lay, has obtained pans running from 4c. to $1 from bottom of shaft. Price & Manley have taken option on Brooks ground in Edison group and have 7 men working in pay. Plan to use Keystone drill for prospecting. Lumbeck & Basset have good prospects on No. 11, second tier bench, and Anderson & Hanson are taking out winter dump on No. 8 bench, first tier, left limit.

RAMSAY-RUTHERFORD (Valdez)—In preparation for extensive work next summer 50 tons of supplies have been freighted over snow to Ramsay-Rutherford mine, seven miles from Valdez.

HEMPLE COPPER CO. (Landlock)—Company owns claims on Copper Mt. on Landlocked Bay and has driven 2000 ft. of tunnel. Recently let contract to Gus Lundstrom to drive additional 100 ft.

VALDEZ CREEK PLACER MINES (Chitina)—W. T. Soule and N. P. Sias will shortly leave from Cordova for the mines to start preparations for next summer's work. Company has already expended about $100,000 in development work and will ship in a Keystone drill, Ingersoll-Rand air compressor and drills. Air compressor will be driven by 58-hp. Pelton water wheel. Hydraulicking will start in May. Cleanup is expected to reach $200,000. George W. Sias, president of the company, will shortly leave Boston for the North.

ARIZONA

Gila County

MIAMI COPPER CO. (Miami)—Rate of production increased considerably above 50% mark.

OLD DOMINION (Globe)—Forced to close down after futile struggle to handle huge volume of water pouring into upper levels of mine caused by unprecedented rainfall during past two months. Normal flow of about 4,000,000 gal. per day increased by this reason to 10,000,000. If water can be kept below 14th level can ship in limited way from Kingdon shaft.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Ledge opened up on the 2150-ft. level 21 ft. wide, milling ore. Orebody on this level is 150 ft. long, which is longer than found on the upper levels. Supply of pebbles for Hardinge mills now obtained from Natomas Consolidated dredge tailing dumps owing to inability to get pebbles from Denmark.

DEFENDER (Pine Grove)—Development resumed above 350-ft. level. Three veins have been disclosed in drifts west from shaft, some of the ore being high grade. When sufficient ore has been extracted and blocked out, mill will be put in operation.

Inyo County

SALINE VALLEY SALT CO. (Owenyo)—W. E. Chapman engaged in salt production at Hutchison, Kansas, has been inspecting this property which is equipped with 13-mile bucket-tram and refining works. About 1000 tons of salt have been sold since first of year. Present production about 30,000 tons per year.

Kern County

LONG TOM DISTRICT is attracting attention from preparations being made for reopening the Long Tom mine and other properties near Kern River. The Hudson property, commonly known as Sycamore mine, will be developed. Stamp mill is being installed.

JOSEPHINE T. G. (Randsburg)—Mill-run in the Red Dog mill of 33 tons yielded $850.

PHOENIX (Randsburg)—Mine to be equipped with 10-stamp mill, concentrating tables, and cyanide plant.

ELLA (Loraine)—Preparations made for driving development tunnel 120 ft. vertically below the shaft house.

CACTUS CONSOLIDATED MINING CO.—This company, reorganization of Cactus Copper Co., Duluth, Minn., has just purchased property of Mammoth Consolidated Mining Co.

BIG BLUE (Kernville)—Attempt to reopen mine resulted in discovery that fire which occurred in shaft last August is still alive. Smoke issued from first opening made and mine was again closed. No information available as to method proposed to extinguish fire.

WERRINGER MINING CO. (Woody)—Permit granted by California Corporation Commission to sell stock. This is first permit issued by new commission in Kern County. Company will sell 100,000 shares at 50c. per share. Property developed by 1000 ft. of underground work. Some shipments of high-grade ore have been made. Large tonnage of ore on dump ready for shipment. Electrical power contemplated.

Mariposa County

RUTH PIERCE (Hornitos)—A 105-hp. electric motor has been installed as substitute for gasoline power. Extensive improvements have been made preparatory to resuming regular operations. H. W. Morris is president.

Nevada County

ELSIE A. (Nevada City)—Development of this property at Round Mountain is contemplated by T. J. Nolan and C. P. Loughbridge.

GASTON (Washington)—Reported that 10-stamp mill will be increased to 20 stamps. Property is operated through a 2000-ft. tunnel. E. T. Moore is manager.

EL ORO (Lake City)—Two compartment shaft sunk to depth of 78 ft. with hand windlass. Preparations for installing power hoist and sinking suspended until roads are improved. Shaft being sunk to tap the blue-gravel channel disclosed by prospecting with a boring machine.

EMPIRE (Grass Valley)—New 5000-hp. hoist installed and other improvements made. Old shaft timbers removed and iron and steel substituted for depth of 150 ft. This improvement will continue below 150-ft. point. Shaft will be increased to double compartment. Deepening shaft to 7500 ft. is contemplated. New 60-stamp mill nearing completion.

Placer County

MAYFLOWER GRAVEL MINING CO. (Forest Hill)—Suits aggregating $17,000 have been brought for damages alleged to have been caused by tailings flowing into irrigation and power ditches.

San Diego County

OWENS (Julian)—Ore will be transported to San Diego by auto truck to be shipped by water to Selby.

Siskiyou County

HAPPY CAMP DISTRICT has three hydraulic mines operating and a new quartz mine recently opened up and preparing for the installation of a stamp mill. The quartz mine was recently purchased by Mr. Anderson of W. E. Wright. Siskiyou hydraulic mine is operating three giants under supervision of Mr. Paine. Reeves-Davis mine completed repairs of the ditch which was damaged by early storms.

NIGGER BOY (Hornbrook)—Mill will be started immediately, gasoline power having been substituted for water.

Trinity County

PLACER MINING CO. (Carrville)—Largest self-shooter in Trinity County being installed at this property on north fork of Coffee Creek.

TRINITY COUNTY HYDRAULIC MINING CO. (Weaverville)—Company in 1914 handled 875,000 cu.yd. of gravel. T. W. Shanks is superintendent.

Tuolumne County

EXPERIMENTAL GULCH (Columbia)—Tunnel now in 2500 ft. will be advanced 250 ft. which it is believed will be sufficient to drain the old works and make possible working the mine at that point.

Trinity County

GOLDEN JUBILEE (Carrville)—Reported that mine will resume operation as soon as weather will permit. Property has been idle for several years.

COLORADO

Chaffee County

MARY MURPHY (Romley)—Report covering past year's operations. Average daily mine output past year was 180 tons of which 30 tons, varying in value from $12 to $50 per ton, was shipped crude to smelteries, remaining 150 tons being put through company's mill. Ore came from vertical depth of 2200 ft. Net returns were $474,000.

Clear Creek County

NEW ERA (Idaho Springs)—Benjamin F. Hall has remodelled mill and is prepared to treat custom ores.

ANNEX MILL (Idaho Springs)—Twenty additional stamps started this week, making total of 40 operating.

MIXELL MILL (Idaho Springs)—Being remodeled for treating zinc ores from Seaton and Foxhall properties. Horn slimer will be installed.

ONEIDA-STAGG (Idaho Springs)—Installing new filter plant, and building compressor house 26x50 ft. Will install motor-driven air compressor. Improvements completed in about 60 days.

Gilpin County

POZO-GILPIN (Idaho Springs)—Engineers' Lease has sunk 100-ft. lift in winze from Newhouse tunnel and has opened, in a drift from bottom, 10-in. streak of high-grade gold ore.

Lake County

WOLFTONE (Leadville)—To provide better ventilation, 450-ft. crosscut being driven on 1st level to connect with Castle View shaft. Another body of smithsonite has been disclosed.

JENNIE JUNE (Leadville)—In outlying East Tennessee Park district near Tennessee Pass on the Denver & Rio Grande R.R., now controlled by new leasing company composed of Denver men who will prosecute development.

WESTERN ZINC OXIDE CO. (Leadville)—Newly incorporated concern of local men has taken over smeltery erected just west of city of Leadville last year and will immediately start plant again to produce high-grade white oxide from the camp's non-sulphide ores.

Ouray County

CAMP BIRD, LTD. (Ouray)—Report for last quarter 1914 shows 8882 tons dry ore milled, bullion value $246,916 yielding net mining profit $139,056. No expenditures for construction. No additions to ore reserves.

San Juan County

IOWA-TIGER (Silverton)—Winze in ground controlled by Melville Lease has reached depth of 150 ft. Level will be driven on vein from bottom of winze and new stoping ground will be opened.

San Miguel County

PRIMOS CHEMICAL COMPANY (Vanadium) — Company now has 65 men at mine and 40 at its mill. Five teams hauling ore from mine to mill. Considerable development is under way and company plans increase in production. A new property being opened up just below Sawpit.

Summit County

WASHINGTON (Breckenridge)—Lessees Theobald and Minchen drifting from bottom of winze sunk from Cornish tunnel, opened 16-in. vein of gold-bearing lead-carbonate alongside good streak of zinc ore.

Teller County

BLUE BIRD (Altman)—Lessees under recent contracts have begun shipments from nearly all the upper levels. On 5th level, the Zell lease has 3-ft. showing of $30 ore.

C. K. & N. (Anaconda)—Development by lessees Richardson Bros. on 500-ft. level in territory that formerly produced heavily has disclosed large shoot of 2-oz. gold ore.

SOUTH BURNS (Victor)—New power plant by Acacia Mining Co. to replace one destroyed by fire is completed. Chief development underground will be in 1100-ft. level.

ZENOBIA (Victor)—Ore from dump is now being worked by George Worth with satisfactory results. Product is being shipped to Portland mill. Estimated that about 40,000 tons of ore in dump can be treated at a profit.

TRAIL TUNNEL (Cripple Creek)—Kishman Leasing Co. has installed new washing plant to take care of increased output. Development in Upper Trail Tunnel is being carried on by Eastman & Company.

MARY McKINNEY (Anaconda)—New compressor has been ordered. As soon as it is installed company will resume sinking of main shaft. New equipment will provide for development to depth of 2000 ft., which is 900 ft. deeper than present lowest level.

ACACIA MINING CO. (Cripple Creek)—Wrockcliffe property, recently secured under lease by Frank Doherty, has been systematically developed with favorable results. A vein of ore has been opened 3 to 4 ft. wide and a value ranging from $20 to $30 per ton.

UNITED GOLD MINES CO. (Cripple Creek)—This company reports following productions of ore during 1914: WILD HORSE, 401 tons worth $3907; W. P. H., 2183 tons, $51,585; DEADWOOD, 1528 tons, $13,868; DAMON, 401 tons, $4279; MAY B., 440 tons, $7673; LONDONDERRY, 13 tons, $62. Wild Horse mill treated 10,704 tons, gross value $36,134.

IDAHO

FORT HALL (Pocatello)—It is reported that T. A. Ferguson, of Butte, has taken bond and lease on this property, and a cyanide plant will be installed in the near future.

THE AMERICAN PLACER MINING CO. (Pierce City)—Company owns 100 acres of placer-ground, and has purchased dredge. Will begin active operations on property early in March. J. M. Porter is manager.

MONITOR (Cœur d'Alene District)—Mine to be developed under supervision of Otis Hill of Spokane, managing director in Montana-Idaho Copper Co., organized several months ago to take over Monitor and adjacent properties.

MICHIGAN

Copper

KEWEENAW COPPER (Calumet) — After cutting large sump, to catch water coming from above the seventh level, has resumed shaft sinking.

INDIANA COPPER (Houghton)—Unable to find bottom extension of its No. 2 diamond drill hole by crosscutting and other search in deepest openings, now crosscutting at sixth level and will open a chamber in its approximate position at that depth in search of it.

NORTH KEARSARGE (Kearsarge)—Inexplicable boiler explosion at No. 3 plant put that shaft out of commission, miners were transferred immediately to No. 1 and rock hoisting was maintained at regular schedule. No. 3 is now in condition to resume operations at any time.

WOLVERINE (Kearsarge)—Average daily tonnage of rock stamped since normal operations were attained, following labor strike of 1913-1914, is about the same as average daily tonnage for five years previous to the strike. This corrects erroneous report in "Journal" of Feb. 20, 1915.

WINONA (Houghton)—Company has about 600,000 lb. of refined copper in storage at Quincy smelter, Hancock, Mich., waiting for opportunity to sell at higher prices. Company passing through period of inactivity at small loss because lessees are working in property and keeping it in prime condition under supervision of company's regular superintendent.

QUINCY (Houghton)—New drilling record made in Quincy No. 2 shaft last Friday with new "Quincy-kid" drilling machine. Record established by Captain Thomas Maunders who drilled 143 ft. of holes in one shift, stope drilling, in copper rock. It was necessary to take down and set up machine in new positions four times in the shift.

Iron

NEWPORT (Ironwood)—All employees at this mine again working full time since Mar. 1. Force has been increased to 900 men.

COLBY (Bessemer)—Corrigan, McKinney & Co. have taken on a few hands here getting the property in shape for a resumption of mining.

CAMBRIA (Negaunee)—Working force at this mine, which had been employed only three days a week since last August, is now on full time.

ASHLAND (Ironwood)—Hoisting of ore was resumed here on Mar. 1, after suspension of several months. While mine was idle extensive repairs were made to No. 3 and No. 9 shafts. Steel sets were put in place of the wood. No. 9 is now steel-timbered from surface to the 17th level.

MINNESOTA

Cuyuna Range

WILCOX (Woodrow)—Canadian-Cuyuna Ore Co. is constructing a number of houses for miners.

ARMOUR NO. 1 (Crosby)—Over 100 men will be put to work at once stripping western end of deposit, adjoining Pennington pit.

INLAND STEEL CO. (Crosby)—This company, operating Thompson, Armour No. 1 and Armour No. 2 mines, will install its own laboratory for doing work heretofore done by independent assayers.

HILL CREST (Ironton)—Cuyuna Range Power Co. is installing substation to distribute power for stripping operations. Mining company will use 300-hp. motor direct connected to 10-in. sand sucker and 250-hp. motor direct connected to 3500-gal. clear-water pump to supply giant nozzle. Four 6-in. pipes are now being driven through overburden to anchor sand sucker. This operation, patterned after hydraulicking scheme used at Rowe mine, will not be as large, having but one unit while Rowe has two giant nozzles. Water will be secured from Black Hoof Lake nearby.

Mesabi County

CROSBY (Nashwauk)—Preparations being made to resume operations. New washing plant is contemplated.

HAWKINS (Nashwauk)—A 60x60-ft. addition will be made to concentrator to cost $50,000. The addition will contain six tables for separating merchantable ore from low-grade.

IROQUOIS (Mountain Iron)—Rogers-Brown Ore Co. has canceled its lease on this mine and most of machinery has already been dismantled and shipped to one of the company's Michigan mines.

CROSBY (Nashwauk)—Cleveland-Cliffs Iron Co. will begin erection of concentrator here as soon as frost leaves the ground. Hoped to have plant running before the ore season is far advanced.

QUINN-HARRISON (Nashwauk)—This mine will ship 500-000 tons this year. Contract recently made calls for shipment of 500,000 tons per year over a term of years. Steel for washing plant has begun to arrive and construction is under way.

MISSOURI-KANSAS-OKLAHOMA

PICHER LEAD CO. (Joplin) has been carrying on an extensive drilling prospecting campaign in northeast Oklahoma field, for past year has opened up some rich orebodies and will now undertake development and construction. O. S. Picher is president.

CAVE SPRING LEAD & ZINC CO. (Galena)—Company is operating the Kramer lease at the present time and is equipping the old mills. Kramer company when it ceased operation a few years ago removed machinery but mill was left standing. A modern 250-ton mill will be completed within the next few weeks.

QUICK ACTION MINING CO. (Galena, Kan.)—Company has purchased Durston property, consisting of 250-ton mill and 40 acres of Luscomb and McElroy land south of Galena. Mine will be unwatered and workmen will be put to work repairing mill. Company expects to have mine in operation within two or three weeks. D. C. Wise, Supt.

MONTANA

Beaverhead County

KEATING GOLD MINING CO. (Radersburg)—Construction of railroad to connect Keating gold mine with Northern Pacific road will begin June 15. Road will be 42-in. gage and will run 14 mi. to a point 2¼ mi. north of Toston. At this point large ore bins will be erected. Will afford rail transportation for Keating, Ohio-Keating and other mining properties nearby. During January, Keating sent 3346 tons of ore to Washoe smeltery. When road is completed output will be increased to 250 tons per day.

Deer Lodge County

WASHOE REDUCTION WORKS (Anaconda)—New leaching plant to treat 2000 tons tailing per day will start in April. Sulphuric-acid plant, capacity 100 tons per day, for furnishing acid for leaching and flotation processes also nearly completed.

Sanders County

DISCOVERY OF COPPER ORE—Henry Thomas, while drilling a well at his ranch across Flathead River, near Dixon, encountered copper rock at depth of 40 ft. Specimens of orebody show high per cent. of copper. Discovery has attracted large number of people to locality and about 80 acres of ground have been located.

Silver Bow County

ALICE MINE (Butte)—Mine owned by Anaconda but idle since 1893 is to be reopened for its zinc ores. Shaft being retimbered.

BUTTE-BALLAKLAVA (Butte)—Will install double-deck cages in its two-compartment shaft, doubling present hoisting capacity.

GREEN COPPER (Butte)—Mine wreckers dynamited and destroyed Green Copper shaft in ground owned by Anaconda

company, Mar. 3. Seven shots were fired. Threats to put working shafts out of commission have been made and companies have been keeping close watch.

BUTTE-DULUTH (Butte)—Option on this property to Anaconda lapsed. Said to be on account of price and not physical condition. Has been optioned for 60 days to new interests not disclosed. John W. Neukam, Duluth, attorney for North Butte Co., elected director of Butte-Duluth, considered significant.

NEVADA

Esmeralda County

JUMBO EXTENSION MINING CO. (Goldfield) made defendant in Federal district court in two suits brought by Booth Reorganized Mining Co., an Arizona corporation, George Wingfield, president. Booth claims the Jumbo Extension vein by right of apex and equity suit asks an accounting on 15,000 tons of ore valued at $60 per ton alleged wrongfully extracted. Restraining order issued pursuant to petition, with hearing set for March.

GOLDFIELD MERGER DEEP MINES LITIGATION (Goldfield)—Word has been received from San Francisco that hearing on the application for permanent receiver for the Goldfield Deep Mines and Goldfield Merger Mines has been continued to Apr. 10, by stipulation between attorneys for the litigants and arrangement with judge of the federal district court at Seattle. Hearing was originally set for Feb. 8, but was continued to Mar. 1 upon application of the complainant, who desired a continuance in order to file an amended complaint.

GOLDFIELD CONSOLIDATED MINES CO. (Goldfield)—Estimated production of this company for February, tons mined, 29,864; gross extraction, $340,000; net realization, $172,000.

Nye County

TONOPAH PRODUCTION for week ended Feb. 27 was 10,367 tons, estimated gross milling value $212,566, as follows: Belmont, 3764 tons; Tonopah Mining, 2650; Tonopah Extension, 1638; West End, 1115; Jim Butler, 1050; Tonopah Merger, 150.

NEW MEXICO

Grant County

BONNIE MINING CO. (Lordsburg)—Company has encountered "blind-vein" in sinking new shaft averaging better than any on property. Width now 3 ft. and value $36 per ton, copper, gold and silver. Work progressing at rate of 5 ft. per day on new shaft.

85 MINING CO. (Lordsburg)—Arizona & New Mexico R.R. has filed intention to build spur from Oil Siding, its line, to 85 mine, which is employing 200 men and shipping regularly to El Paso and Douglas. Second largest producing copper mine in state.

Taos County

BUFFALO-NEW MEXICO MINES CO. (Red River)—Carload mining machinery received at Jaroso and will be sent to property at Red River. Will sink 250 ft. when machinery is installed. Entire district becoming active.

NEW YORK

St. Lawrence County

NORTHERN ORE CO. (Edwards)—New zinc concentrating and separating plant started, replacing mill destroyed by fire last June. New building steel and terra cotta, 102 ft. long, 52 ft. wide, 31 ft. to eaves.

SOUTH DAKOTA

Lawrence County

TROJAN (Trojan)—Enlargements in mill include erection of 40x16-ft. tank equipped with Dorr thickener, to house which superstructure was enlarged; building was also enlarged to give additional space around chilean mills. Work on company hotel suspended until spring.

LEAD (Lawrence)—Annual report of Homestake company shows 1,587,774 tons of ore milled during 1914, average value $3.879 per ton. Total for year $6,160,160.59. Shows increase in tonnage of 46,813 tons and decrease in value of $0.135 per ton over the previous year, $2,210,208 paid in dividends. Total of 17,809 feet of drifting done and two of shafts deepened 150 feet each. Recovery by amalgamation and cyanidation 94% of the assay value of the ore.

UTAH

Juab County

TINTIC ORE SHIPMENTS for week ended Feb. 26 amounted to 90 cars compared to 50 cars week preceding. February output amounting to 297 cars was below normal owing to heavy snowstorms.

GEMINI (Eureka)—Operations to be resumed with force of 60 men, to be increased later. J. C. McChrystal is manager.

YANKEE (Eureka)—Several buildings were knocked over by heavy snowstorms; equipment has been transferred, and operations resumed. There has been little loss.

EUREKA HILL (Eureka)—Seven feet of high-grade silver-lead ore has been opened in the Robinson tunnel by a lessee. In all 20 lessees are at work, most of them operating through the Bullion-Beck shaft.

KNIGHT-CHRISTENSEN MILL (Silver City)—Plant able to operate only 8 to 10 hr. daily on account of water shortage. Supply comes from Dragon Con. Condition to be remedied by lowering pumps from 800 to 1000-ft. level of mine.

LOWER MAMMOTH (Mammoth)—Development is being done on 1000 and 1800-ft. levels; a raise from 1800 is developing large body of ore carrying from 10 to 15% zinc. Lessees are mining zinc ore on 1500 and 1800 and lead-silver and copper ore on other levels.

CHIEF CONSOLIDATED (Eureka)—Gold ore carrying one to two ounces being mined from 800 level. Some gold ore has been opened on the 600 level also; attention is being given to ore of this character on account of low prices of silver and lead. Some zinc ore will probably be mined.

DRAGON CONSOLIDATED (Silver City)—Development work, which has been handled through the Iron Blossom, will be resumed through the Dragon shaft. Drifting will be done on the 800, where bunches of lead ore have been cut. This company furnishes water for Knight mill.

Iron County

COAL CREEK COAL & COKE (Cedar City)—Articles of incorporation for this company were filed with secretary of state, Feb. 24. Capitalization is $1,000,000, divided into 10,000 shares. Company will undertake development of coal fields in Iron County.

Salt Lake County

UTAH COPPER (Salt Lake)—Company is operating two-thirds capacity in its mines and mills.

BINGHAM MINES (Bingham)—Company is shipping daily 100 tons lead-copper ore from the Dalton & Lark and 50 tons of copper ore from Commercial. Dalton & Lark ore is being shipped through the Mascotte tunnel.

COLUMBUS EXTENSION (Alta)—Suit to quiet title to three claims filed against the Cardiff Mining & Milling Co., plaintiff alleging that defendent has filed on claims overlapping the Rubberneck, Gilt Edge and Scorpion lodes, owned by Columbus Extension.

Summit County

PARK CITY ORE SHIPMENTS for week ended Feb. 22 amounted to 4,221,950 lb., by four shippers.

THOR (Park City)—Following recent change in control, offices have been removed from Salt Lake to Provo.

THREE KINGS (Park City)—Shaft is down 325 ft.; there has been a change in the formation, present bottom being in black limestone.

DALY WEST (Park City)—New 200-ton mill, limbered up in December, has produced 600 tons of concentrates. Considerable shipping ore also has been mined.

THOMPSON-QUINCY (Park City)—Meeting has been called for Apr. 3, for changing name to New Quincy Mining Co., with capitalization remaining same, but stock to become assessable.

SNAKE CREEK TUNNEL (Park City)—Work was resumed Feb. 20. Heavy flow of water at breast has not decreased, and drift will be started to tap the fissure at another point and thus relieve flow at face, when driving will be started again. Flow of water at portal is about 7500 gal. per minute.

SILVER KING CONSOLIDATED (Park City)—Connections have been made between 1700 level of this property and 1350 of the Silver King Coalition, thus improving ventilation and adding to safety at both. Silver King Consolidated has been sending its ore down the mountain in bobsleds.

Tooele County

GETHIN-LEROY (Wendover)—Work has been resumed at this property in Silver Island district.

WASHINGTON

Okanogan County

GOLDEN ZONE (Oroville)—Is running 1400-ft. tunnel. Present mill will be enlarged.

GOLDEN KING MINING CO. (Oroville)—Mill will be installed, work to be started next month. Milling ore runs from $6 to $8 a ton from a vein 4 ft. to 10 ft. wide.

Stevens County

TEN MINES IN THE CHEWELAH DISTRICT, which either have never shipped any ore or have been closed down for more than a year, will commence shipping this spring. The Hecla, which came into prominence last year, will install new equipment, all of which is on the ground at the present time. The Blue Star has commenced work on a new double shaft which it expects to sink to the 800-ft. level.

UNITED COPPER MINING CO. (Chewelah)—Will install flotation plant of sufficient capacity to handle output of 150,-ton concentrating plant. This will be first flotation process introduced on a commercial scale in Chewelah district.

WISCONSIN

PENI (Mifflin)—Wm. Holtz and others have purchased the Peni mine.

WILSON (Potosi)—Mining operations have been resumed at Preston Point Mine.

VINEGAR HILL ZINC COMPANY (Mifflin)—Company has leased the Bainbridge land, embracing the Senator mine.

LOOMIS (Platteville)—C. D. Harding and H. B. Mann have purchased mine and equipment formerly known as Little Jack.

BLACK HAWK (Platteville)—Company has made a valuable discovery of dry bone, jack and lead in old workings on Spink land three miles south of Platteville.

CANADA

Ontario

TECK HUGHES (Kirkland Lake)—The option held by the Nipissing on this mine has been dropped.

ORE CHIMNEY (near Kaladar, Frontenac Co.)—Shaft down to 261-ft. level and 700 ft. of underground work done. A 20-stamp mill being installed.

CASEY COBALT—Exploration work on the East Casey, 1800 ft. from main shaft, disclosed 6-in. vein of milling ore. Another promising vein has been cut at 134 feet.

CANADIAN COPPER CO. (Copper Cliff)—Announced that Crean Hill and No. 2 mines will be reopened and all of the blast furnaces at smeltery started. This means the company will run full time. Frood mine will not be reopened, as company practically abandoned that pit last summer for Creighton where superior material was found.

MEXICO

Hidalgo

SANTA GERTRUDIS CO., LTD. (Pachuca)—Report for last quarter 1914 shows 64,429 dry tons produced, bullion value £77,669 yielding net mining profit £33,099. Crushing rate at mill reduced to 40% of capacity due to scarcity of supplies account of suspension of traffic via Vera Cruz. Operations at mine not hampered by local unrest.

The Market Report

METAL MARKETS

NEW YORK—Mar. 10

Copper and lead have been distinctly firmer. Tin rose to high figures because of the scarcity of supplies. The inflated spelter market collapsed.

Copper, Tin, Lead and Zinc

Copper—Some moderate business was done in the early part of the week with consumers at prices netting about 14.35c., cash, New York. The latter part of the week there was an increased demand and sales were made at 14⅝@14¾, regular terms, with 14¾ firmly established at the close. A fairly large business is reported to have been consummated. Certain agencies are entirely sold out for early deliveries, and for what they can supply later are asking prices above the present market.

Copper sheets show no change in the base price, which is 19¾c. per lb. for hot rolled and 20¾c. for cold rolled. Usual extras charged and higher prices for small quantities. Copper wire is quoted at 15¼@15¾c. per lb., carload lots at mill.

Visible stocks of copper in Europe Feb. 28 are reported as follows: Great Britain, 16,316; afloat from Chile, 2275; afloat from Australia, 5125; total, 23,716 long tons. No stock reported at Rotterdam.

Copper exports for the week ended Feb. 27 are reported by the Department of Commerce at 10,171,000 lb., the larger items being 5,100,000 lb. to France, 2,961,000 lb. to Italy and 1,622,000 lb. to England. Imports for the week were 2,664,000 lb. metal and 840,000 lb. in ore and matte; 3,504,000 lb. in all, chiefly from Chile.

A cablegram from the U. S. consul-general at Christiania, Norway, says that embargo has been placed on all copper and brass plates, bars, bolts, spikes, nails, pipes, and foundry pieces.

Tin—There was something of a panic over the scarcity of supplies because of the shipping situation, but the business done either on the advance or the subsequent decline was relatively inconsequential. As one authority remarked "It was more of a movement on paper than anything else. Orders to buy 100 tons would put the price up to 50c. while orders to sell the same quantity would put it down to 40 cents."

Lead—Business with domestic consumers continued rather slack, but there was a good demand from abroad. The A. S. & R. Co. advanced its price to 3.95c., New York, on Mar. 5. Sales for export were made later at an advance over the A. S. & R Co. quotation.

Spelter—While fancy prices were still being paid for spot and March spelter, the business represented thereby amounted to relatively trifling quantities. The inability of producers to place the tonnages that they had to sell against their intake of ore became more pronounced. Alarming news was received respecting the extent to which the high level of price was restricting consumption, especially among the galvanizers. This led producers to believe that they had been riding the whirlwind a little too long, and beginning on Mar. 4, strenuous efforts were made to place tonnages for any deliveries from April onward. This idea occurred to many sellers at the same time, and all kinds of efforts were made in the attempt to find a market. The unsoundness and danger of the previously existing situation were fully recognized, and no bones were made about offering spelter at 1@1½c. below previous quotations. In the latter part of the week April-May and May-June spelter was offered in large lots at 8c. with intimations of better terms to any one who wanted to do business. Even with such cuts buyers could not be found, and it is still too early to prophesy where the market is going to come into relative equilibrium. The scarcity of spelter for prompt delivery is genuine, but on the deliveries beyond March, the producers loosened up and stood not upon the order of their going. The disappearance of active demand, and the forthcoming production of old plants that are being started up were contributory factors.

Zinc sheets are again higher and are quoted today at $13.50 per 100 lb. f.o.b. La Salle, Ill., less 8% discount. Usual extras charged. The demand is very good, especially for early delivery.

On Mar. 3, in New York, 2000 shares of Edgar Zinc Co. were sold at auction at $75 per share.

Exports from Baltimore for the week included 288,030 lb. spelter and 433,680 lb. zinc dross to Great Britain.

Other Metals

Aluminum continues quiet, on a moderate but steady business. Quotations are unchanged at 19@19¼c. per lb. for No. 1 ingots, New York—**Antimony** has again advanced sharply, supplies being short. There has been no large business, and quotations are rather nominal, at 21@22c. per lb. for ordinary brands. For Cookson's 25@27c. per lb. is asked—**Nickel** is unchanged, ordinary forms being 40@45c. per lb. according to size and terms of order. Electrolytic, 3c. higher—**Quicksilver** has been strong and some excitement developed in the market. As high as $75@80 has been reported for small orders; but today's quotation for large lots is $65 per

DAILY PRICES OF METALS IN NEW YORK

Mar.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
			14.30		3.90	3.80	*8.17½	*8.00
4	4.8075	49⅛	@14.40	44½	@3.95	@3.85	@8.67½	@8.50
			14.30			3.80	*8.17½	*8.00
5	4.8100	49¼	@14.40	48	3.95	@3.85	@3.67½	@8.50
			14.40			3.85	*8.17½	*8.00
6	4.8088	49⅜	@14.50	48	3.95	@3.90	@8.67½	@8.50
			14.45		3.95	3.87½	*7.67½	*7.50
8	4.8075	50⅛	@14.55	48	@4.00	@3.92½	@8.17½	@8.00
			14.45		3.95	3.87½	*7.67½	*7.50
9	4.8050	50	@14.55	46½	@4.00	@3.92½	@8.17½	@8.00
			14.55		3.95	3.87½	*7.67½	*7.50
10	4.8025	51	@14.60	45	@4.00	@3.92½	@8.17½	@8.00

* Nominal.

The quotations herein are our appraisal of the markets for copper, lead, spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The difference between the price delivered and the New York cash equivalent is at present 0.15 to 0.20c. on domestic business and 0.25 to 0.37½c. on European. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Feb.-Mar.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
4	23⅛	63⅛	13.71	63⅜	....	181½	162	20 1/16	4.39	43¾	9.51
5	23 1/16	63½	13.80	64	....	184	162½	20 1/16	4.41	44½	9.67
6	23⅛	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8	23⅛	63⅞	13.88	64⅛	....	190	166	20 1/16	4.49	44½	9.67
9	23 1/16	64⅛	13.99	64¼	....	190	165½	20 1/16	4.52	44½	9.67
10	24 1/16	64⅛	13.99	64¼	....	188	164½	20⅛	4.54	44½	9.67

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10=2.17½c.; £15=3.26¼c.; £20=4.35c.; £30=6.52c.; £60=13.05c. Variations, £1 = 0.21¼c.

flask. San Francisco, $60@63 for domestic business. London price is £12 15s. per flask, with £12 10s. quoted from second hands.

Minor Metals—Current sales of **Bismuth** have been at $2.75 per lb., New York. **Selenium**—Quotations are $2@3 per lb. for larger quantities; $4.50@5 per lb. for smaller lots.—**Cadmium** is quoted in London at 6s.—$1.44—per lb.—**Tellurium** is reported sold at 80s.—$19.20—per lb. in London.

Gold, Silver and Platinum

Gold—Among the arrivals of gold at New York during the week was $750,000 from Denmark.

Silver—Owing to a concurrent demand from the Continent and India on a market not very well supplied with silver, the price in London has had a sharp advance the past week. The fact that no steamers are sailing for England this week carrying bullion has also, no doubt, an influence on the London price.

Iridium—Prices are still high and irregular. The metal is scarce and quotations vary according to the needs of purchasers.

Platinum—The market is quiet and sales for the most part are small. There is still a considerable variation in prices and we continue to quote $38@42 per oz. for refined platinum, and $44@49 per oz. for hard metal.

Our Russian correspondent writes under date of Feb. 5 that the improvement of the market, mentioned in the previous report, still continues. At Ekaterinburg considerable business in small lots is to be noted for the last fortnight. The dealers and speculators voluntarily buy small portions at 8 rubles per zolotnik—$30.08 per oz. The export of platinum is entirely stopped. After the war a great revival of the platinum business is expected. At Petrograd the nominal price is 31,000 rubles per pood—$30.38 per oz.—for crude metal, 83% platinum.

Zinc and Lead Ore Markets

JOPLIN, MO.—Mar. 6

Blende, high price $76; assay base 60% zinc, low lead $73@70; high lead, $70@65; metal base suspended; calamine, base 40% zinc $42@40, low lead; average, all grades of zinc, $67.53 per ton. Lead, high price $49.85; base $47 per ton of 80% metal content; average, all grades of lead, $47.40 per ton.

SHIPMENTS WEEK ENDED MAR. 6

	Blende	Calamine	Lead	Values
Totals this week..	7,752,510	855,220	1,124,600	$317,260
Totals this year...	99,071,820	9,696,170	14,671,040	$3,493,420

Blende value, the week, $272,840; 10 weeks, $2,972,270.
Calamine value, the week, $17,780; 10 weeks, $175,620.
Lead value, the week, $26,640; 10 weeks, $345,530.

PLATTEVILLE, WIS.—March 6

The base price paid this week for 60% zinc ore was $72 per ton. The base price offered for 80% lead ore was $48 per ton. No sales of lead ore reported.

SHIPMENTS WEEK ENDED MAR. 6

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	2,076,120	.....	426,800
Year	35,250,720	470,000	3,559,900

Shipped during week to separating plants, 3,873,060 lb. zinc ore.

Iron Trade Review

NEW YORK—March 10

Improvement in the iron and steel trades is still in order, though the increase in new business is slow. The proportion of mill capacity employed is gradually growing.

Export business is growing, notwithstanding the drawbacks of high ocean freight rates and scarcity of vessels. Bars and wire are most in demand; also steel blooms and billets.

The demand for structural steel is gradually improving, and more new contracts are coming forward. Bridge material is more in demand as the season advances.

Pig Iron Production in February again increased. The reports of the furnaces, as collected and published by the "Iron Age," show that on March 1 there were 176 coke and anthracite stacks in blast having a total daily capacity of 63,050 tons; an increase of 6750 tons over Feb. 1. Making allowance for the charcoal furnaces the total production of pig iron in the United States was 1,695,500 tons; for the two months ended Feb. 28 it was 3,326,900 tons. Of this total 2,353,250 tons, or 70.6%, were made by furnaces owned or operated by steel companies.

PITTSBURGH—Mar. 9

The steel mills are operating at fully 60% of their ingot capacity, showing a slight increase in the past fortnight. Orders for finished steel are coming in at a rate sufficient to maintain the pace, but no material increase is to be expected. There has been scarcely any railroad buying and there is hardly any structural steel being let, so that the present rate of operation indicates an almost normal consumption in miscellaneous lines. Merchant bars, which have a wider distribution among consumers than any other product, are in proportionately better demand than the majority of steel products, most of the large mills operating at 65 to 75% in this product.

The reported order of the Illinois Central placed with the Algoma Steel Co. at the Canadian Soo turns out to have been for 35,000 tons of rails, at $27.40, delivered Chicago, when the road could have bought at $30, f.o.b. Chicago or Ensley, from the domestic mills. The sales of the Canadian mill to roads in the United States now total about 60,000 tons, and it is understood more business is sought.

Finished steel prices are well maintained. She 1.10c. price on bars, plates and shapes has practically disappeared, the mills quoting 1.15c. on March business and 1.20c. on second quarter. As specifications are now coming in well on 1.10c. contracts the real test of the market will come in April or May.

Pig Iron—The pig-iron market continues very dull, there being no important inquiry for bessemer or basic, while buying of foundry grades is confined to small lots. We quote: Bessemer, $13.60; basic, $12.50; malleable, $12.75; foundry, $12.75@13.25; forge, $12.50@12.75, f.o.b. Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—The English producers have advanced their contract price from $68 to $78, Baltimore, and now indicate that there will be deliveries of moderate tonnages, equally alloted between recent $68 contracts and old contracts at $35@38. Small lots of spot material are quoted at about $100.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 274,935 short tons; shipments, 201,712 tons. As compared with the first week in the year this is an increase of 65,333 tons in production, and 61,573 tons in shipments. Production of Greensburg and Upper Connellsville districts, 37,015 tons.

Connellsville Coke—The Perry Iron Co., Erie, Penn., is inquiring for furnace coke for second quarter or the remainder of the year, 10,000 to 12,000 tons monthly. We quote: Prompt furnace, $1.50; contract furnace, second quarter, $1.60; balance of year, $1.75; prompt foundry, $2@2.30; contract foundry, $2.20@2.30, per net ton at oven.

Coal and Coke Tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie in the month of January, in short tons:

	1914	1915	Changes
Anthracite	893,453	894,529	I. 1,076
Bituminous	3,820,719	3,571,345	D. 249,374
Coke	846,950	685,546	D. 161,404
Total	5,561,122	5,151,420	D. 409,702

The total decrease this year was 7.3%. The greatest proportional decrease was in coke.

Chemicals

NEW YORK—March 10

The general chemical markets are quiet and business improves slowly as a rule.

Arsenic—Business is very quiet and not much improvement is looked for. Prices are unchanged at $3.75@4 per 100 lb. for both spot and futures.

Copper Sulphate—Business is steady and sales fair. Quotations are now $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is fair and prices are strong. Quotations are 2.20c. per lb. for spot and up to July 1; 2.17½ per lb. for later deliveries.

PETROLEUM

Exports of mineral oils from the United States in January were 163,292,765 gal. in 1914, and 146,769,701 gal. in 1915; a decrease of 16,522,064 gal., or 10.1%, this year.

The monthly summary of the "Oil City Derrick" reports new wells completed in February as follows: Pennsylvania grade, 261; Lima-Indiana, 40; Central Ohio, 101; Kentucky, 7; Illinois, 35; Kansas-Oklahoma, 387; Texas-Louisiana, 100; the total number being 931. The new production credited to the wells was 149,816 bbl., an increase of 1281. Included in the list are 182 dry holes and 198 gas wells. At the close of February there were 488 rigs and 1416 wells drilling.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt.
Acacia, g.	Colo.	1,454,304	$ 1	$ 122,004	Jan '11	$0.01
Adams, s.l.c.	Colo.	1,438,989	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	80,000	25	2,400,000	July '14	2.00
Alaska Mexican, g.	Alas.	50,000	5	3,453,381	Feb. '15	0.20
Alaska Treadwell, g.	Alas.	180,000	25	15,085,000	Feb. '15	1.00
Alaska United, g.	Alas.	200,000	5	1,792,990	Feb. '15	0.30
Am. Zinc, Lead & Sm.	U. S.	180,200	25	983,320	Jan. '14	0.50
Anaconda, c.	Mont.	168,640	25	94,245,000	Jan. '15	0.25
Argonaut, g.	Calif.	4,992,500	5	1,620,000	Jan. '15	0.30
Arizona Copper, pf.	Ariz.	200,000	1.20	2,009,744	Nov. '14	.....
Arizona Copper, com.	Ariz.	1,426,120	1.20	17,092,498	Feb. '15	0.18
Bagdad-Chase, g., pf.	Calif.	1,519,896	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	84,819	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	Utah	100,000	5	385,695	Apr. '14	0.10
Bonanza Dev., g.	Colo.	228,690	1	1,425,000	Oct. '11	0.20
Brunswick, g.	Calif.	395,287	1	106,727	Nov. '14	0.06
Bunker Hill Con., g.	Calif.	300,000	1	820,000	Feb. '15	0.02½
Bunker Hill & Sul., l.s.	Ida.	200,000	10	15,955,500	Feb. '15	0.25
Butte-Alex Scott, c.	Mont.	327,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	Mont.	74,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	250,000	1	286,550	Feb. '15	0.02
Calumet & Arizona, c.	Ariz.	617,385	10	20,941,522	Dec. '14	0.50
Calumet & Hecla, c.	Mich.	616,758	25	124,250,000	June '14	5.00
Camp Bird, g.s.	Colo.	100,000	5	10,318,109	Jan. '15	0.08½
Centen'l-Eur., l.s.g.c.	Utah	1,100,051	5	4,050,000	Apr. '14	1.50
Center Creek, l.s.	Mo.	100,000	10	521,000	Jan. '15	0.05
Champion, c.	Mich.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	871,384	1	262,969	Aug. '14	0.05
Chino, c.	New Mex.	777,458	5	4,081,120	Dec. '14	0.50
Cliff, g.	Utah	864,820	1	90,000	Jan. '13	0.10
Cliff, g.	Alas.	300,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging.	Colo.	100,000	10	650,000	Sept. '14	1.00
Colorado, l.s.g.	Utah	100,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	1,000,000	5	226,832	Oct. '07	0.20
Commercial Gold.	Ore.	285,540	1	43,750	Dec. '10	0.00½
Con. Mercur, g.	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	330,000	Jan. '15	0.50
Copper Range Con., c.	Mich.	393,692	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l.	Utah	300,000	1	900,000	Dec. '14	0.15
Daly West, s.l.	Utah	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,783	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	304,601	Oct. '14	0.05
Elkton Con., g.	Colo.	2,500,000	1	3,479,460	Nov. '14	0.02
El Paso, g.	Colo.	490,000	5	1,707,545	Feb. '14	0.10
Ernestine, g.s.	N.M.	300,000	5	120,000	Dec. '12	0.05
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	8,986,946	Dec. '14	1.00
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	258,000	Oct. '14	0.02
Frontier, z.	Wis.	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,305,000	Dec. '14	10.00
Gold Chain, g.	Utah	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	3,825,000	Feb. '15	0.05
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	27,932,086	Feb. '15	0.10
Grand Central, g.	Utah	500,000	1	1,620,750	Sept. '14	0.05
Granite, g.	Colo.	1,650,000	1	270,000	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	3,210,000	Feb. '15	0.01
Hercules, l.s.	Idaho	1,000,000	1	5,550,000	Dec. '13	.....
Homestake, g.	S. D.	218,400	100	36,808,682	Feb. '15	0.65
Horn Silver, l.s.z.	Utah	400,000	25	5,642,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	233,499	Aug. '14	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	9,250	Dec. '14	1.00
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	2,170,000	Oct. '14	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,950,000	Dec. '14	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	187,500	Nov. '14	0.01
Kendall, g.	Mont	500,000	5	1,505,000	July '14	0.06
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	259,000	Apr. '13	0.50
Knob Hill, g.	Wash.	1,000,000	1	70,000	Oct. '13	0.00½
Liberty Bell, g.	Colo.	133,552	5	1,559,179	Sept. '13	.....
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,169,308	July '14	0.02
May Day, g.s.l.	Utah	800,000	0.25	172,000	Feb. '15	0.02
Mexican, g.s.	Nev.	201,600	2.50	161,910	June '14	0.75
Miami, c.	Ariz.	746,759	5	3,712,249	Aug. '14	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	Mich.	100,000	25	3,375,000	Feb. '15	1.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	488,588	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,524	5	16,976,708	Dec. '14	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,680,000	Apr. '14	0.10
North Butte, c.	Mont.	410,000	15	11,890,000	July '14	0.50
North Star, g.	Cal.	250,000	10	4,537,040	Dec. '14	0.70
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,807,000	Dec. '14	0.50
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging.	Cal.	700,000	5	1,553,136	Aug. '14	0.12
Osceola, c.	Mich.	96,150	25	12,179,675	July '14	1.00
Parrot, c.	Mont.	229,850	10	7,462,712	Feb. '15	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	7,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Iad.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev.	2,790,000	1	771,200	July '14	0.02
Portland, g.	Colo.	3,000,000	1	9,897,080	Jan. '15	0.02
Quilp.	Wash.	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich.	110,000	25	20,897,500	Dec. '13	1.25

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt.
Ray, c.	Ariz.	1,482,436	$ 10	$3,266,796	Sept. '14	$0.37½
Republic, g.	Wash.	1,000,000	1	170,000	Nov. '12	0.01½
Rochester, l.s.	Mo.	4,900	100	190,846	July '12	0.50
Round Mountain, g.	Nev.	866,426	1	363,365	Aug. '13	0.04
Seven Troughs Coal., g.	Nev.	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,472,252	10	9,422,240	Dec. '14	0.05
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	2,275,000	Feb. '15	0.50
Silver King Coal., l.s.	Utah	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	365,000	Oct. '14	0.01
Snowstorm, c.g.	Ida.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	Calif.	299,981	1	391,880	Feb. '15	0.05
Standard Con., g.s.	Cal.	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g.	Colo.	1,000,000	0.60	456,625	Dec. '14	0.03
Success, z.	Ida.	1,500,000	1	930,000	June '13	0.02
Superior & Pitts., c.	Ariz.	1,499,792	10	8,578,820	Dec. '14	1.00
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	4,456,250	Jan. '15	0.75
Tomboy, g.s.	Colo.	310,000	4.85	3,634,065	Dec. '14	0.48
Tom Reed, g.	Ariz.	909,555	1	2,264,764	Dec. '14	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	7,080,500	Feb. '15	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	707,574	Jan. '15	0.07½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	12,350,000	Jan. '15	0.25
Tri-Mountain, c.	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	2,127,500	Dec. '14	7.00
United Verde, c.	Ariz.	300,000	10	34,822,000	Feb. '15	0.75
Utah, s.l.	Utah	100,000	10	281,860	Dec. '10	0.02
Utah, c.	Utah	1,624,290	10	25,807,813	Dec. '14	0.75
Utah Con., c.	Utah	300,000	5	8,550,000	Dec. '14	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	3,127,000	Jan. '15	0.03
Wasp No. 2, g.	S. D.	500,000	1	466,966	Dec. '14	0.01
Wellington Mines, g.	Colo.	10,000,000	1	350,000	July '13	0.00½
Wolverine, c.	Mich.	60,000	25	7,980,000	Dec. '14	2.00
Yak, s.l.	Colo.	1,000,000	1	1,847,685	Dec. '14	0.02
Yankee Con., g.s.	Utah	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,159,789	Feb. '15	0.03
Yellow Pine, l.s.s.	Nev.	1,000,000	1	453,008	Dec. '14	0.03
Yukon Gold, g.	Alas.	3,500,000	5	6,622,000	Dec. '14	0.07½

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$91,280,147	Feb. '15	$0.50
Am. Sm. & Ref., com.	U. S.	500,000	100	27,333,333	Dec. '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	50,458,333	Dec. '14	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	9,945,000	Oct. '14	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	14,375,000	Oct. '14	1.25
Greene Cananea.	U. S.	450,642	100	4,371,646	June '14	1.00
Guggenheim Expl.	U. S.	380,315	25	20,927,995	Jan. '15	0.87½
Inter'l Nickel, com.	U. S.	115,826	100	14,846,438	Dec. '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	8,358,491	Feb. '15	1.50
National Lead, com.	N. Y.	206,554	100	8,415,884	Dec. '14	0.75
National Lead, pf.	N. Y.	243,676	100	29,266,672	Dec. '14	1.75
Old Dominion, c.	Ariz.	293,245	25	5,853,713	Dec. '14	0.50
Phelps, Dodge & Co.	U. S.	450,000	100	36,659,304	Dec. '14	3.50
U. S. Steel Corp., com.	U. S.	5,083,025	100	222,360,438	Dec. '14	0.50
U. S. Steel Corp., pf.	U. S.	3,602,811	100	376,598,255	Feb. '15	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,348	50	6,362,181	July '14	0.75
U. S. S., R. & M., pf.	U.S.-Mex.	351,114	50	15,092,929	Jan. '15	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 212,500	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	1,580,884	Feb. '15	0.03
B. C. Copper.	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s.	Ont.	1,996,490	1	469,868	July '14	0.03
Buffalo, s.	Ont.	1,000,000	1	2,757,000	July '14	0.03
Canadian Goldfields, g.	B. C.	600,000	0.10	290,000	July '14	0.001½
Chontalpan, g.s.l.z.	Mex.	7,000	25	57,750	May '14	0.75
Cobalt Townsite, s.	Ont.	45,000	1	1,042,259	May '14	0.10
Coniagas, s.	Ont.	800,000	5	6,880,000	Feb. '15	0.30
Con. M. & S. Co. of Can	B. C.	58,052	100	1,825,677	Jan. '15	2.00
Crown Reserve, s.	Ont.	1,768,814	1	5,996,278	Jan. '15	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dos Estrellas, g.s.	Mex.	300,000	0.50	10,335,000	Dec. '13	1.50
El Oro, g.s.	Mex.	1,147,500	4.85	8,668,418	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c.	B.C.	148,496	100	5,533,457	June '14	1.50
Greene Con., c.	Mex.	1,000,000	10	9,544,400	May '14	0.50
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold.	B. C.	120,000	10	1,524,000	Dec. '14	1.00
Hollinger, g.	Ont.	600,000	5	2,850,000	Feb. '15	0.20
Kerr Lake s.	Ont.	600,000	5	5,520,000	Dec. '14	0.25
La Rose Con., s.	Ont.	1,498,627	5	5,162,327	Jan. '15	0.25
Le Roi No. 2, g.	B. C.	120,000	24.30	1,472,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	2,912,876	Feb. '15	0.10
McK.-Dar. Sav. s.	Ont.	2,247,692	1	4,405,471	Feb. '15	0.03
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g.	C. A.	150,000	10	3,610,000	Jan. '15	0.30
Nipissing, s.	Ont.	1,200,000	5	12,690,000	Jan. '15	0.25
Peñoles, s.l.g.	Mex.	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	840,000	Oct. '13	3.00
Right of Way Mns†s.	Ont.	1,685,500	1	219,115	Nov. '14	0.02
Rio Plata, s.	Mex.	374,518	5	345,745	Feb. '13	0.05
San Rafael, g.s.	Mex.	2,400	25	1,442,380	Jan. '14	0.50
San Toy, g.s.	Mex.	5,750,000	1	530,000	July '13	0.01
Sorpresa, g.s.	Mex.	19,200	20	3,979,240	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	1,550,000	Sept. '14	0.02½
Timiskaming, s.	Ont.	2,500,000	1	1,384,155	Apr. '13	0.06
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,940,250	Nov. '14	3.00
Trethewey, s.	Ont.	1,000,000	1	1,061,998	July '14	0.05
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	637,465	Oct. '13	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

Assessments

Company	Delinqe	Sale	Amt.
Brunswick Con., Nev	Feb. 16	Mar. 9	$0.01
Caledonia, Nev	Mar. 8	Mar. 31	0.05
Confidence, Nev	Mar. 11	Mar. 31	0.10
Con. Virginia, Nev	Feb. 24	Mar. 18	0.10
Copper King, Ida	Mar. 1	Apr. 1	0.005
East Hercules, Ida, (post.)		Mar. 3	0.001
Emerald, Utah (three instal.)		June 9	0.01
Galena King, Utah	Mar. 25	Apr. 25	0.0075
Gethin Le Roy, Utah (post.)	Feb. 16	Mar. 7	0.02
Idaho-Nevada, Ida	Mac. 10	Apr. 2	0.002
Index, Ida	Feb. 27	Mar. 27	0.005
Indiana, Mich	Feb. 4		1.00
Iron King, Ida	Feb. 18	Mar. 19	0.001
Jack Waite, Ida	Mar. 1	Mar. 24	0.01
Kentuck, Nev	Mar. 18	Apr. 7	0.02
Keystone, Utah. (post)	Feb. 23	Mar. 23	0.02
King Pine Crk., Ida	Feb. 12	Mar. 13	0.002
Laciede, Ida	Mar. 20	Apr. 6	0.003
Majestic-Idol, Nev	Dec. 15	Jul. 20	0.005
Neva, Utah,	Mar. 18	Apr. 12	0.002
Nor. Bnkr. Hill, Ida	Jan. 30	Mar. 6	0.002
Ophir, Nev	Feb. 11	Mar. 5	0.10
Oreano, Ida	Mar. 25	Apr. 26	0.0015
Overman, Nev	Mar. 8	Mar. 26	0.05
Pioche Metals	Mar. 20	Apr. 20	0.0025
Rescue-Eula, Nev	Feb. 11	Mar. 22	0.01
Rio Grande, Utah	Mar. 25	Apr. 17	0.003
Saltese, Ida	Mar. 1	Apr. 1	0.002
Selma, Utah	Mar. 20	Apr. 6	0.0025
Sierra Nevada, Nev	Feb. 8	Mar. 2	0.05
Snowstorm Ex., Ida	Feb. 19	Mar. 22	0.003
Sonora, Ida	Mar. 15	Apr. 15	0.002
Sunset, M. & D., Nev	Mar. 27	May 3	0.015
Syndicate, Ida. (post.)		Jan. 28	0.001
Tarbox, Ida. (post.)	Jan. 28	Mar. 25	0.0025
Tar Baby, Utah	Mar. 5	Apr. 5	0.005
Tonopah Midway, Nev	Mar. 12	Apr. 12	0.01
Torino, Ida	Feb. 20	Mar. 20	0.001
Union Chief, Utah	Feb. 18	Mar. 15	0.01
Utah, Nev	Mar. 25	Apr. 15	0 02
Utah-United, Utah	Feb. 20	Mar. 15	0.01
Wanlass	Jan. 30	Mar. 20	0.00375
Wolf Mountain, Utah	Mar. 15	Apr. 14	0.0015

Stock Quotations

General financial conditions have continued to improve and the stock market has been strong all the week, especially the coppers. Zinc stocks have been high, but perhaps a little shaky.

COLO. SPRINGS Mar. 9		SALT LAKE Mar. 9	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.06	Beck Tunnel	.06½
Banner	.01½	Black Jack	.10
Cripple Cr'k Con	.007	Colorado Mining	.11½
C. K. & N	.06	Crown Point	.02½
Doctor Jack Pot	.08½	Daly-Judge	5.25
Elkton Con	.45	Gold Chain	.10
El Paso	1.45	Grand Central	.60
Findlay	.03½	Iron Blossom	.99
Gold Dollar	.04	Little Bell	.10
Gold Sovereign	.05	Lower Mammoth	.05½
Isabella	.16¾	Mason Valley	1.15
Jack Pot	.06½	May Day	.13½
Jennie Sample	.03	Opohongo	.01½
Jerry Johnson	.03	Prince Con	.44½
Lexington	.0075	Seven Troughs	.02½
Mary McKinney	.31½	Silver King Coal'n	3.10
Pharmacist	.01½	Silver King Con	1.90
Portland	1.10	Sioux Con	.05½
Raven B. H	.03½	Uncle Sam	.06
Vindicator	1.25	Yankee	.06

TORONTO Mar. 9			
Bailey	.02	Dome Exten	.05
Coniagas	4.25	Foley O'Brien	.15
Peterson Lake	.21	Hollinger	22.25
Right of Way	.03	Imperial	.01½
Seneca Superior	1.25	Jupiter	.08
Silver Queen	.02	McIntyre	.31
T. & Hudson Bay	20.00	Pearl Lake	.01½
Timiskaming	.16	Porcu. Gold	‡.25
Wettlaufer-Lor	.05	Preston E. D	.01½
Big Dome	6.75	Rea	.10

SAN FRANCISCO Mar. 9			
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.17½	Belmont	4.85
Belcher	.32	Jim Butler	.70
Best & Belcher	.06	Lone Star	.07
Caledonia	.26	MacNamara	.03
Challenge Con	‡.05	Midway	.13
Confidence	.24	Mont.-Tonopah	.48
Con. Virginia	.16	North Star	.15½
Crown Point (Nev.)	.32	Rescue Eula	.11
Gould & Curry	.04	West End Con	.53
Hale & Norcross	.04	Atlanta	.31
Julia	.01	Booth	.30
Mexican	.38	C.O.D. Con	.05
Occidental	.85	Comb. Frac	.08
Ophir	.11	Jumbo Extension	.91
Overman	.12	Pitts.-Silver Peak	.10
Potosi	.02	Round Mountain	.37
Savage	.05	Sandstorm Kendall	.08
Sierra Nevada	.10	Silver Pick	.08
Union Con	.20	Central Eureka	‡.25
Yellow Jacket	.52	So. Eureka	‡2.25

N. Y. EXCH. Mar. 9		BOSTON EXCH Mar. 9	
Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	54⅞	Adventure	1
Am.Sm.&Ref.,com	63¾	Ahmeek	275
Am. Sm. & Ref., pf.	102	Alaska Gold M	30½
Am. Sm. Sec., pf. B.	‡78	Algomah	.50
Anaconda	26½	Allouez	41½
Batopilas Min	‡50	Am. Zinc	27⅛
Bethlehem Steel	55¾	Ariz. Com., ctfs	4
Bethlehem Steel, pf.	104	Bonanza	.32
Chino	35⅛	Butte-Balaklava	2⅛
Colo. Fuel & Iron	24⅛	Butte & Superior	48½
Federal M. & S., pf.	24¼	Calumet & Ariz	54
Great Nor., ore, ctf.	31⅛	Calumet & Hecla	385
Guggen. Exp	51	Centennial	17½
Homestake	116	Copper Range	35
Inspiration Con	19⅝	Daly West	2
Mex. Petroleum	67	East Butte	9⅛
Miami Copper	20½	Franklin	5½
Nat'l Lead, com	54	Granby	67
National Lead, pf	106	Hancock	11½
Nev. Consol	12¾	Hedley	28
Ontario Min	2	Helvetia	.30
Phelps Dodge	‡175	Indiana	3⅝
Quicksilver, pf.	1½	Island Cr'k, com	44
Ray Con	17½	Island Cr'k, pfd	88½
Republic I&S, com	20⅛	Isle Royale	21½
Republic I&S, pf	77½	Keweenaw	2½
SlossSheffi'd, com	26	Lake	7
Tennessee Copper	27⅛	La Salle	3½
Utah Copper	53⅛	Mass	4½
U. S. Steel, com	45½	Mayflower	4½
U. S. Steel, pf	104½	Michigan	.60
		Mohawk	57½
N. Y. CURB Mar. 9		New Arcadian	5½
Name of Comp.	Clg.	New Idria Quick	‡3½
Beaver Con	.26	North Butte	24⅛
Big Four	.08	North Lake	1
Blue Bell	.06	Ojibway	.70
Braden Copper	6⅛	Old Colony	3⅛
Buffalo Mines	⅛	Old Dominion	40½
Can. Cop. Corpn	1	Osceola	72
Can. G. & S	.03	Quincy	56
Caribou	.45	Santa Fe	1
Chambers Ferland	.12	Shannon	5½
Con. Ariz. Sm	.25	Shattuck-Ariz	21
Coppermines Cons	‡1½	Superior	26⅛
Davis-Daly	.82	Superior & Bost	1
Diam'field-Daisy	.07	Tamarack	30½
Dia. Black B	.03	Trinity	3½
Ely Con	‡.01	Tuolumne	.28
Florence	.54	U. S. Smelting	22
Goldfield Con	1⅛	U. S. Smelt'g, pf.	40½
Goldfield Merger	.22	Utah Apex	2½
Greene Cananea	27	Utah Con	10½
Kerr Lake	4⅛	Victoria	1½
La Rose	11/16	Winona	2⅛
McKinley-Dar-Sa	.50	Wolverine	43½
Mines of Am	2	Wyandot	.50
Mutual Min., pf	‡2½		
Nevada Hills	.28	BOSTON CURB Mar. 9	
New Utah Bingham	.32	Name of Comp.	Bid.
Nipissing Mines	5½	Alvarado	.60
Ohio Copper	.08	Bingham Mines	‡3¼
Oro	.09½	Boston Ely	.14
Pacific Smelt	½	Butte & Lon'n Dev.	.20
South Utah	10	Calaveras	1 3/16
Stand'd Oil of N.J.	392	Calumet-Corbin	.10
Standard S. L	1⅛	Chief Con	.80
Stewart	1⅛	Corbin	.50
Tonopah	7 7/16	Cortez	.15
Tonopah Ex	2⅛	Crown Reserve	.80
Tonopah Merger	.40	Eagle & Blue Bell	.78
Tularosa	⅛	First Nat. Cop	1⅛
West End Ex	.03½	Houghton Copper	1½
Yukon Gold	2⅛	Iron Cap Cop., pf	3
		Majestic	.13
LONDON Feb. 20		Mexican Metals	.14
Alaska Tre'dwell	£7 2s 6d	Nevada-Douglas	.33
Camp Bird	0 7 6	New Baltic	1⅛
El Oro	0 9 0	Oneco	.40
Esperanza	0 9 6	Raven Copper	.08
Mexico Mines	4 0 0	Smokey Dev	.10
Oroville	0 11 9	So. Lake	5
Philippine Dr	1 0 0	Tonopah Victor	‡.17
Santa Gert'dis	0 11 3	Trethewey	.10
Tomboy	1 3 1½	United Verde Ext	2⅛
Tough Oakes	0 13 0		

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	.....	26.669	26.788	.....
April	59.490	58.519	.....	27.416	26.958	.....
May	60.361	58.175	.....	27.825	26.704	.....
June	58.990	56.471	.....	27.199	25.948	.....
July	58.721	54.678	.....	27.074	25.219	.....
August	59.293	54.344	.....	27.335	25.979	.....
September	60.640	53.290	.....	27.986	24.260	.....
October	60.793	50.654	.....	28.083	23.199	.....
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.491	14.394	65.259	63.494	70.188	*
March	14.131	.....	64.276	.....	69.170	.....
April	14.211	.....	64.747	.....	69.313	.....
May	13.996	.....	63.182	.....	67.786	.....
June	13.603	.....	61.336	.....	66.274	.....
July	13.223	.....	60.540	.....	64.955	.....
August	*	.....	‡	.....	‡	.....
September	*	.....	‡	.....	‡	.....
October	*	.....	‡	.....	‡	.....
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	13.602	.....	61.524	.....	68.168	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	.....	173.619	.....
April	36.154	.....	163.963	.....
May	33.360	.....	150.702	.....
June	30.577	.....	138.321	.....
July	31.707	.....	142.517	.....
August	*	.....	‡	.....
September	32.675	.....	‡	.....
October	30.284	.....	‡	.....
November	33.304	.....	139.391	.....
December	33.601	.....	147.102	.....
Av. year	34.301	.....	156.564	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.306	19.122
March	3.970	.....	3.850	.....	19.651	.....
April	3.810	.....	3.688	.....	18.225	.....
May	3.900	.....	3.808	.....	18.503	.....
June	3.900	.....	3.810	.....	19.411	.....
July	3.891	.....	3.738	.....	19.051	.....
August	3.875	.....	3.715	.....	‡	.....
September	3.828	.....	3.658	.....	‡	.....
October	3.528	.....	3.384	.....	‡	.....
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	19.079	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	.....	5.100	.....	21.460	.....
April	5.113	.....	4.963	.....	21.569	.....
May	5.074	.....	4.924	.....	21.393	.....
June	5.000	.....	4.850	.....	21.345	.....
July	4.920	.....	4.770	.....	21.568	.....
August	5.568	.....	5.418	.....	‡	.....
September	5.380	.....	5.230	.....	‡	.....
October	4.909	.....	4.750	.....	‡	.....
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.061	.....	22.544	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15.07	.....	13.94	.....	14.10	.....
April	14.90	.....	13.90	.....	14.13	.....
May	14.90	.....	13.90	.....	14.27	.....
June	14.90	.....	13.90	.....	13.96	.....
July	14.90	.....	13.90	.....	13.90	.....
August	14.90	.....	13.90	.....	14.08	.....
September	14.90	.....	13.90	.....	14.03	.....
October	14.84	.....	13.75	.....	13.97	.....
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....